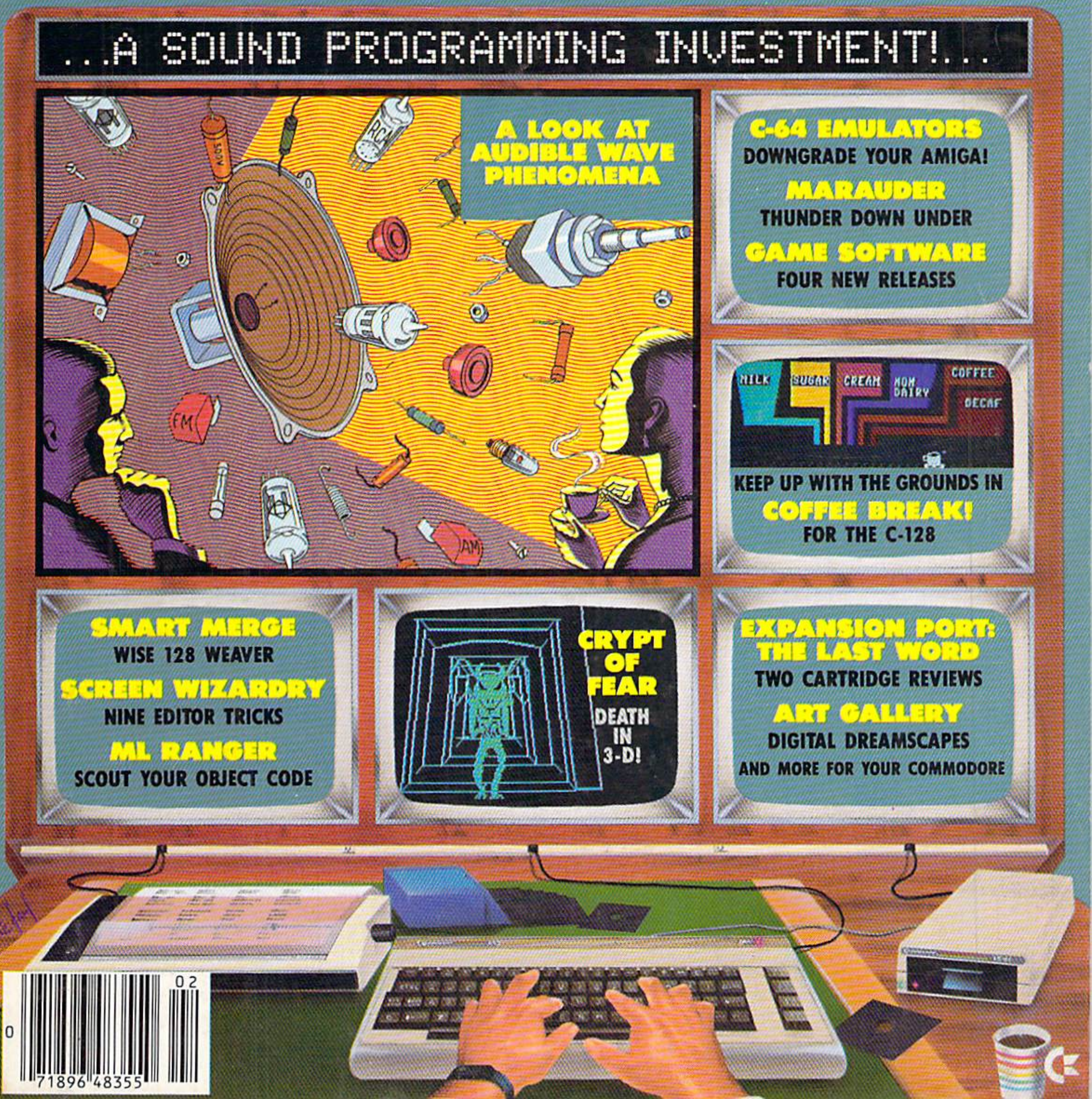
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Ahoy!

$2.95/ CAN. $3.35
FEBRUARY 1988



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Ahoy!

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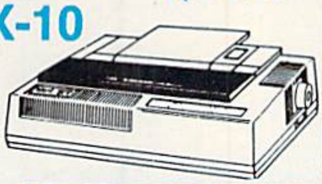
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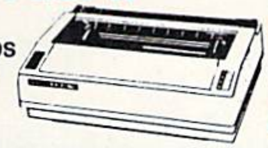
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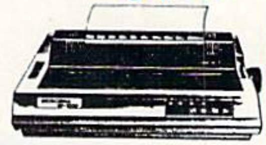
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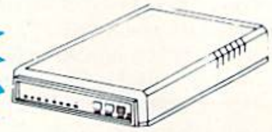
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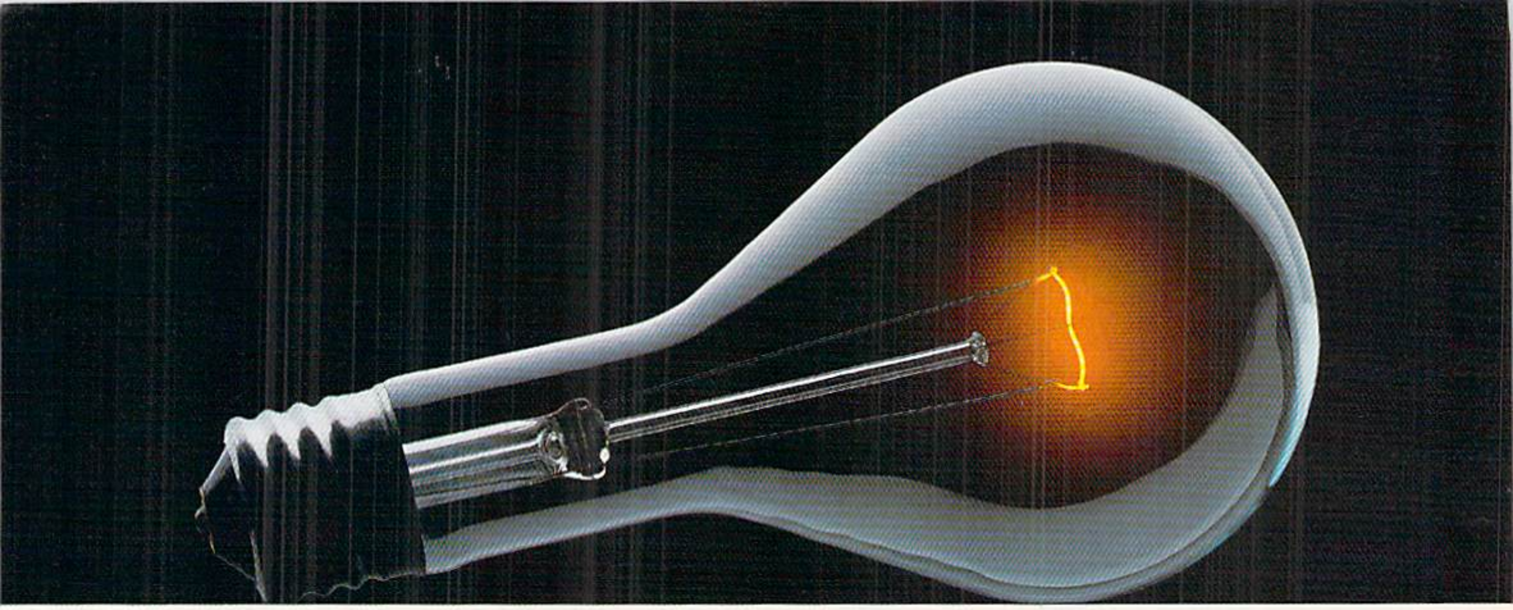
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VIEW FROM THE BRIDGE

Even as we celebrated our fourth anniversary in January, we knew another milestone was only 30 days ahead. As some basic arithmetic skills or a glance at the bottom right corner of our contents page will reveal, you're holding the 50th issue of *Ahoy!* Big changes—all for the better—are ahead as we climb toward the century mark. We'll tell you about them next month. This month, we have another announcement too exciting to share the spotlight.

Based on reader response, *Vault of Terror* (Oct. '86) and *Dark Fortress* (Jan. '87) are the most popular games we've ever published. As we've told the many of you who've inquired about sequels, Cleve Blakemore has been working on both for some time. In the interest of making this special issue truly special, Cleve spent many nights on the graveyard shift finishing them off. He met this month's deadline with both—but only *Crypt of Fear*, 3-D fantasy follow-up to *Vault of Terror*, was short enough for publication. But rather than see our plans thwarted, we've included the mammoth *Dark Fortress II* as a free bonus on this month's *Ahoy! Disk.* To find out how to get a master map and hint sheet for *Dark Fortress II*, see page 61. To enter the *Crypt of Fear*, turn to page 18.

And to hear about the rest of the 50th issue of *Ahoy!*—read on:

• Much of this month's *Rupert Report* has nothing to do with computers. But to understand BASIC 7.0 sound generation, some background in the physics of sound is a must—and Dale Rupert provides the *Sound Enlightenment* you need, including audiovisual aid in the form of two C-128 programs. (Turn to page 32.)

• Computer gamers don't know what it means to battle deadly flying saucers until they've played *Coffee Break!* Dan Komaromi's maiden *Ahoy!* effort turns your C-128 into a coffee shop chock full of caffeine-crazed commuters demanding service. (Turn to page 16.)

• Commodore 64 emulation software has been eagerly awaited by Amiga owners with vast C-64 libraries. With the arrival of the first entries in this category—*The 64 Emulator* and *GO 64!*—is it time to tag your 64, 1541, and 1702 for the next yard sale? Read Morton Kevelson's report on *C-64 Emulators for the Amiga* and decide. (Turn to page 53.)

• They say a magician never reveals his secrets. But this month, Cleve Blakemore turns his top hat inside out to share his *Screen Wizardry* with the rest of us. You're free to include these nine C-64 editor routines in your original programs—and then sell them back to us! (Turn to page 31.)

• And if this issue's *Crypt of Fear* doesn't convince you that Cleve's programming secrets are worth acquiring, we offer exhibit two: *Marauder*, a show-stopper of a chopper game. (Turn to page 60.)

• Just as its Texan namesakes rode to the rescue in many a western movie, John Fedor's *ML Ranger* will save the day for assembly language programmers with a need to relocate object code in memory. (Turn to page 49.)

• And to make the C-128 user's life easier, Shawn K. Smith's *128 Smart Merge* permits the linking of programs without the problems usually associated with merge and append utilities. (Turn to page 50.)

• We all know Morton Kevelson's philosophy: that anything worth doing is worth doing to excess. His attention to detail tends to yield amazing results, such as the three-part survey of Commodore expansion port devices that concludes in this issue's *Reviews* section with *Blowup* and the 64K *Quick Brown Box*. (Turn to page 63.)

• On the fun and games side of software reviewing—though it's doubtful that Arnie Katz, Bill Kunkel, and Joyce Worley enjoy playing games more than Morton enjoys opening cartridges—our *Entertainment Software Section* profiles *Sub Battle Simulator, Chuck Yeager's Advanced Flight Trainer, Defender of the Crown,* and *Paperboy.* (Turn to page 44.)

Rounding out this issue are all your favorite features: *Tips Ahoy!*, packing the programming insights of the ages into bite-sized routines; an *Art Gallery* of C-64 and Amiga masterpieces; *Commodares*, programming puzzles ranging from difficult to merciless, and more.

We wish a fast recovery to Buck Childress, sidelined for the next few months by the recurrence of an old eye ailment. We know Buck's well-deserved rest from programming will do the trick, and that he'll soon be hogging our program section once again!

—David Allikas

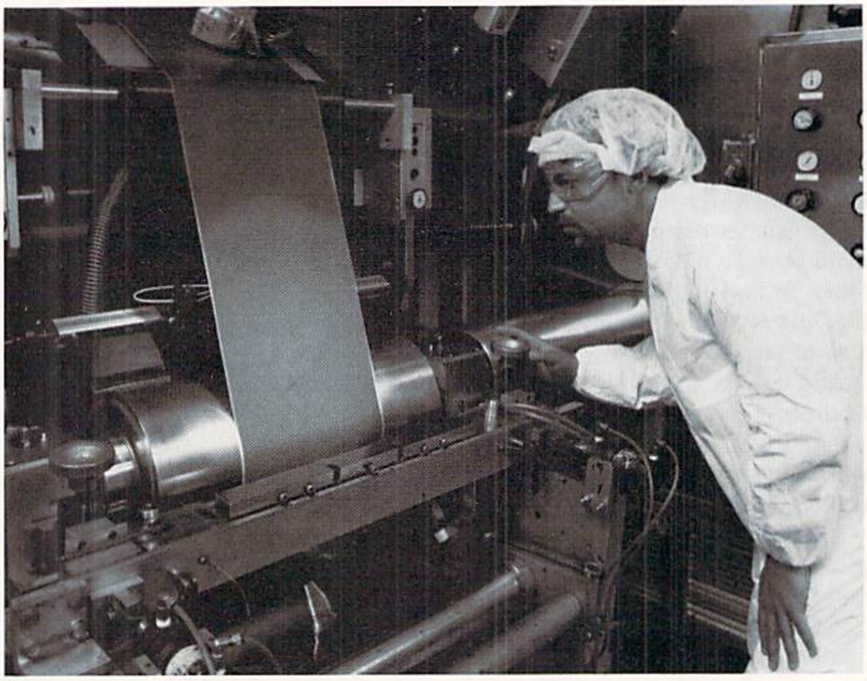
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TEFLON DISK

The DataLifePlus floppy disk features a Teflon coating which offers protection against some of the typical office and home accidents that cause data loss, including fingerprints, smudges, and spills. Most substances, Verbatim claims, will simply wipe off the surface, which is smoothed and sealed from edge to hub with a thin Teflon coating. A card enclosed in every box provides instructions on dealing with accidents, some of which may require that the disk be removed from its jacket. The floppies will retail for about 15% more than Verbatim's ordinary DataLife line and include a lifetime warranty.

Verbatim News Services, 716-724-5130 (see address list, page 14).



Applying Teflon coating to the sheeting from which the recording surface of the DataLifePlus disk is made. *READER SERVICE NO. 140*

FICHE STORY

An update to *Microfiche Filer* for the Amiga, Version 1.02, provides full support for European characters. It also includes a text import utility for incorporating into *Microfiche Filer* the fixed format text files that nearly all databases can output. The update costs $9.00; or, the text import utility can be obtained on Q-Link, PeopleLink, BIX, or Fred Fish disk #103.

Additionally, Software Visions is soliciting its customers for useful databases to be published on the next update disk. Published donors will be credited on the disk and will receive it free.

Software Visions Inc., 617-877-1266 (see address list, page 14).

GAMES

Star Trek: The Rebel Universe ($29.95), third in Simon & Schuster's C-64 text adventure series, centers around a Klingon mind control plot to turn Federation members into violent rebels. You must lead the crew of the Enterprise through the Quarantine Zone and halt the uprising. Spock, Kirk, McCoy, and other characters can be summoned onscreen for assistance. You're equipped with three levels of star map magnification, a transporter for beaming down to planets of your choice, and such weapons as photon torpedoes and phasers.

Simon & Schuster Software, 212-373-8882 (see address list, page 14).

Galactic Frontier ($29.95) lets the C-64 owner search for life among the 200 billion stars in the galaxy. Stars, planets, and moons are graphically represented, and accompanied by data which is correct according to current theory. Star data includes spectral class and number, luminosity, type, spectroscopic analysis, diameter, temperature, and age. Planet data consists of color, chemical analysis, length of day and year, distance from star, volcanic activity, temperature, atmospheric pressure, and more.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 14).

Two for the 64 from SSI:

Panzer Strike! engages players in individual squad or tank level combat on WWII's Eastern and North African fronts, as well as combat involving the British army throughout Europe. The game is intended for advanced players interested in simulating single battles or entire campaigns.

Available in early spring, *Songs of Liberty* ($34.95) recreates the Revolutionary War battles of Bunker Hill, Saratoga, and Monmouth. The game sys-

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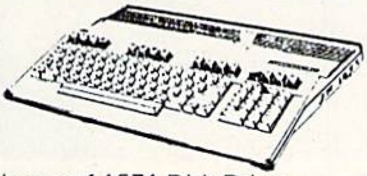
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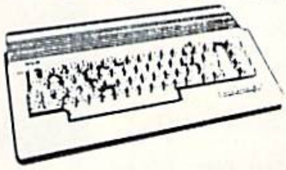
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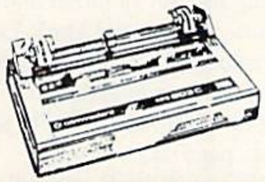
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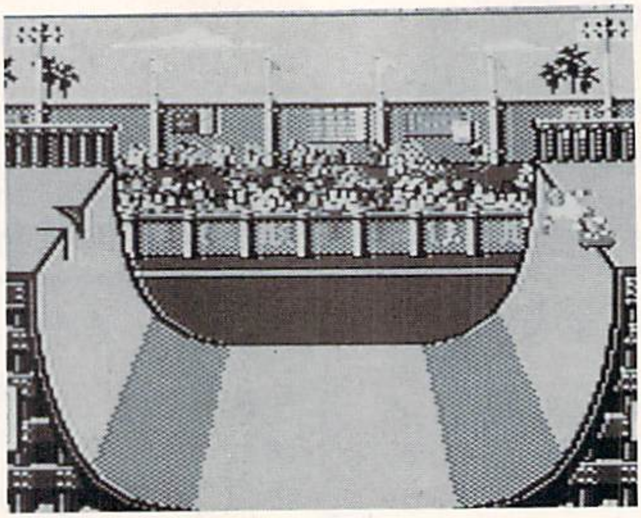
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Among **Skate or Die's** *events are the downhill race (over and under hurdles, through a construction pipe, around gravel) and ramp freestyle (combine as many turns as you can in ten passes through the chute and up the ramp).* ***READER SERVICE NO. 126***

tem of *Gettysburg: The Turning Point* is utilized, with certain changes made to increase realism, such as the placement of greater emphasis on line and column movement and the use of smaller map squares (100 yards) due to the limited firing range of muskets.

Strategic Simulations, Inc., 415-964-1353 (see address list, page 14).

Two from Mindscape for the 64:

Superstar Soccer lets you take your pick of playing, managing, or coaching. As player, you'll need to learn to feint, trap, kick, juggle, and more. If you choose to coach, you'll run the training camp, make lineups, and call onfield strategies. And as team owner/general manager you'll recruit new talent and make trades in preparation for a championship season. $34.95 for the 64; available for the Amiga first quarter 1988.

Infiltrator II ($34.95) continues the feud between The Mad Leader and Captain Johnny "Jimbo Baby" McGibbits in a helicopter simulation and three land-based graphic adventures.

Mindscape, Inc., 312-480-7667 (see address list, page 14).

For the 64 from Electronic Arts:

Skate or Die ($29.95) lets 1-8 skateboarders compete in ramp freestyle, downhill race, ramp high jump, pool joust, or downhill jam. All the moves of real skateboarding are included, such as hand and leg plants, kickturns, backside and frontside aerials, and ollies.

And for the 64 from EA's Datasoft subsidiary:

As a crew member aboard a Hughes A-64A Apache helicopter, the *Tomahawk* ($29.95), you'll utilize 13 onboard computers and automatic fault detection to fight for your life against deadly enemies and deadlier weather. You can begin with a selection of training missions and four pilot-training levels.

Dark Lord ($19.95) begins with your discovery of your grandfather's journal, detailing his life in the Alterworld, orchestrating the war of Good and Evil. Good won, but the evil Dark Lord is about to rise again. You must enter the Alterworld and stop him.

Electronic Arts, 415-571-7171 (see address list, page 14).

4th & Inches ($29.95), an action-oriented C-64 football simulation, incorporates 22 players and a full width and length field. Over 20 plays and 11 formations are included. On offense the player controls the action through the ball carrier, beginning with the quarterback; on defense, through the key defensive player. The field view, which is that of the spotter in the press box, changes as the play progresses.

Accolade, 408-446-5757 (see address list, page 14).

VIDEOTAX

Tax Master 1987 ($30.00) covers the new tax laws and guides the user through the preparation of Forms 1049 and 4562 (depreciation) and Schedules A (itemized deductions), B (interest and dividends), C (small business), D (capital gain/loss), E (rent/royalty income/loss), and F (farm income/loss). The program includes all tables, and automatically performs calculations and figures your tax. Data can be stored on disk so that a preliminary estimate can be updated as exact information (W-2 forms, bank statements) becomes available. Included is a coupon good for a substantial discount on the 1988 version.

Master Software, 301-922-2962 (see address list, page 14).

The Early Bird Edition of *The Tax Advantage* contains the latest IRS information on tax year 1987 as of August 1. By the time you read this, The Final Edition will have been released, incorporating the regulations decided upon by the IRS in October and November. The program helps C-64 users prepare Forms 1040, 2106, 2441, 4562, and 6251, and Schedules A, B, C, D, E, F, and SE. Either version costs $59.95, but early birds can update for $15.95.

Double Eagle Software, Inc., 213-459-9748 (see address list, page 14).

GOTO MARKET

Although it arrived $500 billion too late, *The Strategist* ($29.95) will help C-128 users time their strategies for investing in stocks, bonds, mutual funds, and commodities. By starting with a historical quote file and a user-specified strategy and making simulated trades, the program will measure how much a given strategy would have paid or cost an investor. The program will then vary the strategy to arrive at the highest payoff. A C-64 version, currently under development, will retail for $24.95.

Strategy Software, 907-457-2294 (see address list, page 14).

L.A. AMIGA SHOW

Hot on the heels of its New York success (70 exhibitors and 8000+ attendees), AmiEXPO puts in an appearance at The Westin Bonaventure in Los Angeles January 16-18. The Amiga convention will feature seminars on color desktop publishing, desktop video, music, advanced graphics, and CAD applications. Admission is $20, $25, and $30 for one, two, and three days respectively; seminars are $5 each or 6 for $25.

AmiEXPO, 212-867-4663 or 800-32-AMIGA (see address list, page 14).

VOICE MASTER JR.

The Covox Voice Master Junior ($39.95), a less expensive version of the $89.95 original, allows C-64 users to record and save digitized speech for subsequent use in BASIC programs. Word recognition templates can be made, with up to 32 words or phrases usable at once and others accessible from disk. The included Covox Composer lets the user compose music simply by whistling a tune.

Covox, Inc., 503-342-1271 (see address list, page 14).

LIGHT PEN FLASHES

Inkwell's Light Pen with Amiga Light Pen Driver (Model 184-A–$129.95) is plug-compatible with the Amiga 500, 1000, 2000, and A20000 (German). Two touch-actuated switches allow the user to replace or alternately use the mouse. The software can be run from either CLI or Workbench, and works with all Amiga programs using the Intuition Pointer interface.

Through January, Inkwell will offer bonus disks with its Graphics Galleria series of clip art for use with *Flexidraw* and *DOODLE!* The newest release, *The Office*, will include *Borders and Signs;* all other titles will come with a free blank disk.

Inkwell Systems, 619-268-8792 (see address list, page 14).

PRINT UTILITIES

The *Utility Disk* provides users of Seikosha's Commodore-compatible SP-180VC, SP-1000VC, or SP-120VC printers with six graphics programs: Disk Label Maker, Calendar Maker, Letterhead Maker, Sign/Banner Maker, Checkbook Balancer, and Printer Enhancer (for setting a variety of typefaces and sizes, along with italics, underscoring, etc.). Valued at $20, the



Voice Master Junior's *built-in mike permits hands-free digitization.* *READER SERVICE NO. 127*

disk is available for $7.95 with the purchase of any of the printers mentioned above.

Seikosha America Inc., 201-529-4655 (see address list, page 14).

DO THE 81

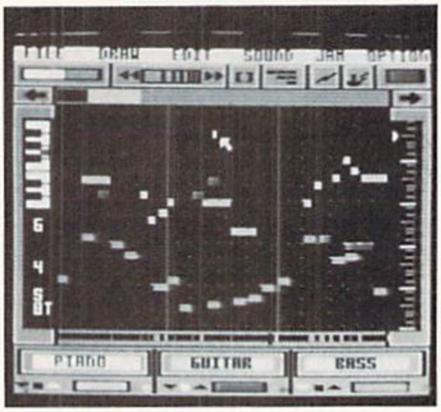
Super 81 Utilities ($39.95) will let C-128 and 1581 disk drive owners copy whole disks from 1541 or 1571 format to 1581 partitions, copy 1541 or 1571 files to 1581 disks; copy 1581 files to 1571 disks, and back up 1581 disks or files with one or two 1581's, as well as perform many CP/M and DOS functions. Included are a 1581 disk editor with simultaneous display in hex or ASCII, 1581 drive memory monitor, and RAM writer.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 14).

PRINTER CADDY

If you need to use several different colors or sizes of continuous form paper with your printer, Feed-A-Form ($89.95) makes changing them more convenient. The end of four stocks of continuous forms are held above and behind the printer, each sandwiched between two acrylic bars. When a particular form is needed, the operator pulls it forward into the printer. An optional catch basket made of plastic-coated wire is $39.95.

Feed-A-Form, 617-326-2171 (see address list, page 14).



Instant Music ***insures the proper mix.***
READER SERVICE NO. 130

INSTANT C-64 MUSIC

The C-64 adaptation of *Instant Music* ($29.95) allows users to play the lead instrument in a three-piece band, choosing from among the twelve provided or synthesizing a new one. As in the Amiga version, the rules of music theory are reconstructed to insure that the player never hits a "wrong" note. MIDI out and MIDI sync are both supported.

Electronic Arts, 415-571-7171 (see address list, page 14).

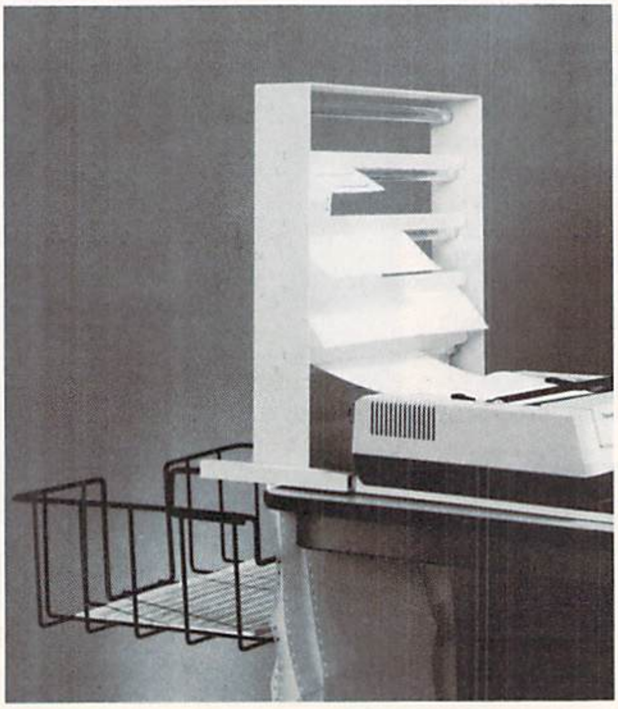
SUPER AIDE

Super Aide resides in memory to offer C-64 users a variety of programming tools, including auto line numbering and renumbering, bidirectional scrolling, trace, file appending, find and replace, device # selection, hi- and lo-res screen dumps, and unNEW. Price is $29.95, with shipping included.

Free Spirit, 312-352-7323 (see address list, page 14).

WRITING CONTEST

Scholastic's fourth annual *Story Tree* Writing Contest offers youngsters the chance to win a



Feed-A-Form keeps 4 continuous forms always at the ready.
READER SERVICE NO. 131

grand prize of an Apple computer or one of ten runner-up prizes of $100 worth of Scholastic software. Prizes will be awarded in two categories: elementary (grades 4-6) and junior high (grades 7-9). Entry deadline is April 15.

Scholastic Inc., 212-505-3000 (see address list, page 14).

TRAVEL PROGRAM

Ticket to Spain ($29.95) sends the C-64 traveler through the country in search of a family heirloom. With a limited budget and a series of tasks to fulfill, the player visits towns like Madrid, Toledo, and Barcelona exploring landmarks, conversing with locals, and shopping and dining in authentic locales, all the while learning about Spanish culture, language, history, and geography. The game can be played in English or Spanish.

Blue Lion Software, 617-876-2500 (see address list, page 14).

68000 PROGRAMMING

Amiga Assembly Language Programming helps the reader utilize the 68000 microprocessor to its full potential, with information on the system's hardware and software configuration, editor and assembler operations, number manipulation, handling the 68000's addressing modes and instruction set, and more. A calculator program illustrates many of the concepts discussed.

TAB Books Inc., 717-794-2191 (see address list, page 14).



SupraModem 2400 comes complete with operator's manual, quick-reference card, and telephone cable. *READER SERVICE NO. 143*

2400 BAUD MODEM

The SupraModem 2400 ($179.95), Hayes-compatible and about one-third the size of the Hayes SmartModem 2400, supports asynchronous operation at 300, 1200, and 2400 bps. User configurations, created by issuing simple commands, are stored in nonvolatile memory. Other features include a programmable-volume speaker and compatibility with Bell 103/212A, CCITT V.22, and CCITT V.22bis protocols.

Supra Corporation, 503-967-9075 (see address list, page 14).

Companies Mentioned in *Scuttlebutt*

Accolade
20813 Stevens Creek Blvd.
Cupertino, CA 95014
Phone: 408-446-5757

AmiEXPO
211 E. 43rd St., Ste. 301
New York, NY 10017
Phone: 212-867-4663 or 800-32-AMIGA

Blue Lion Software
P.O. Box 650
Belmont, MA 02178
Phone: 617-876-2500

Covox, Inc.
675 Conger Street
Eugene, OR 97402
Phone: 503-342-1271

Double Eagle Software
2210 Wilshire Blvd.
Santa Monica, CA 90403
Phone: 213-459-9748

Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404
Phone: 415-571-7171

Feed-A-Form
29 Dover Terrace
Westwood, MA 02090
Phone: 617-326-2171

Free Spirit Software
538 S. Edgewood
LaGrange, IL 60525
Phone: 312-352-7323

Inkwell Systems
5710 Ruffin Road
San Diego, CA 92123-1013
Phone: 619-268-8792

Master Software
6 Hillery Court
Randallstown, MD 21133
Phone: 301-922-2962

Mindscape
3444 Dundee Road
Northbrook, IL 60062
Phone: 312-480-7667

Scholastic Inc.
730 Broadway
New York, NY 10003
Phone: 212-505-3000

Seikosha America Inc.
1111 MacArthur Blvd.
Mahwah, NJ 07430
Phone: 201-529-4655

Simon & Schuster Software
One Gulf + Western Plaza
New York, NY 10023
Phone: 212-373-8882

Software Visions Inc.
26 Forest Road
Framingham, MA 01701
Phone: 617-877-1266

Strategic Simulations
1046 N. Rengstorff Ave.
Mountain View, CA 94043
Phone: 415-964-1353

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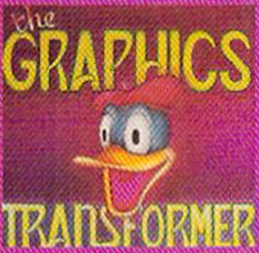
Supra Corporation
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Albany, OR 97321
Phone: 503-967-9075

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THE GRAPHICS TRANSFORMER – $34.95
(C-64/C-128)
★ ★ ★ ★ ★ (Megagalactic Software Weekly)

" . . . THE GRAPHICS TRANSFORMER is the greatest graphics utility since the release of OMNI-PAINT. It allows you to quickly and easily convert between ALL of the popular drawing programs (over 25 supported), and does other neato things as well. I highly recommend it to all software consumers . . ."



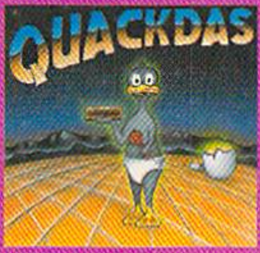
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(Amiga)
$ $ $ $ $ (Business Software & Galaxian Report)

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" . . . NEOFONT is the most artistic and well designed collection of fonts for the GEOS operating system. It contains over 23 different fonts, that are simply sublime. Do yourself a favor, and appreciate some REAL art . . ."



1541 AUNTIE BUMP BOARD – $49.95
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★ ★ ★ ★ ★ (Buyit Magazine)

" . . . it's surprising that the generic mortal species hadn't come up with a device to ELIMINATE the damaging knock on the 1541 disk drive before now. After looking at the circuit board, I've come to the conclusion that they did it almost as good as the Vorkons could've . . ."



ENTROPY – $29.95
(Amiga/C-64/C-128 compatible)
? ? ? ? ? ? ? (The Hitchhiker's Guide to Galaxian Software)

" . . . an interesting implementation of an adventure game. It's hard to believe that so many abstract perversions can be contained in one place. ENTROPY is destined to become another milestone in the realm of interective fiction . . ."



THE MANDELBROT POSTER – $9.95
(compatible)
★ ★ ★ ★ ★ (Fractagalactic & Surfer Weekly)

" . . . what can you say about a software company that markets posters. The fabled Mandelbrot Set is now captured on paper (where available — some restrictions might apply), using the highest resolution ever experienced to date . . ."

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Reader Service No. 300

COFFEE BREAK!

For the C-128

By Dan Komaromi

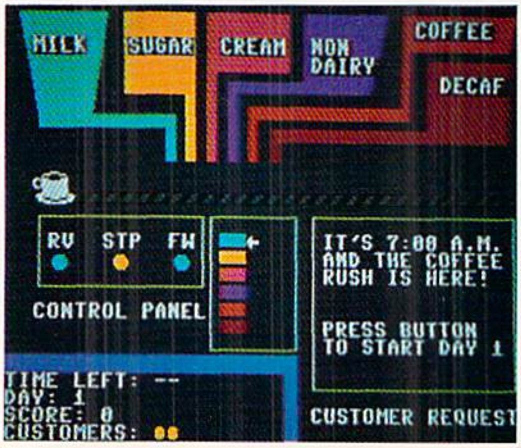


PHOTO: MICHAEL R. DAVILA

If you're sick of battling aliens, try your hand at a test of skill, coordination, and memory right here on earth. This game simulates one of the most terrifying jobs on the face of the planet...serving coffee to rush-hour yuppies!

You are working in a coffee shop near the entrance gates to the Staten Island Ferry, through which thousands of money-crazed, upwardly mobile Wall Street types file each morning on the way to their Fortune 500 jobs. Of course, none of them are going anywhere without their early morning cup of coffee, and you'll find it very difficult to serve these customers quickly and correctly without losing your job.

Plug your joystick into Port 2 and press the fire button to begin. You start day one with no points and slightly less than a minute to serve three separate customers with your automatic coffee machine. You can control the cup conveyor belt with the horizontal plane of the joystick, moving it left or right to bring it under the mouth of the correct dispenser tube.

To turn the different tubes on or off, use the vertical plane of the joystick to select the matching color from the control panel and press the fire button. If you hit the cup, you'll hear a tiny "blip." If you miss, it'll go down the drain—but you can always try again.

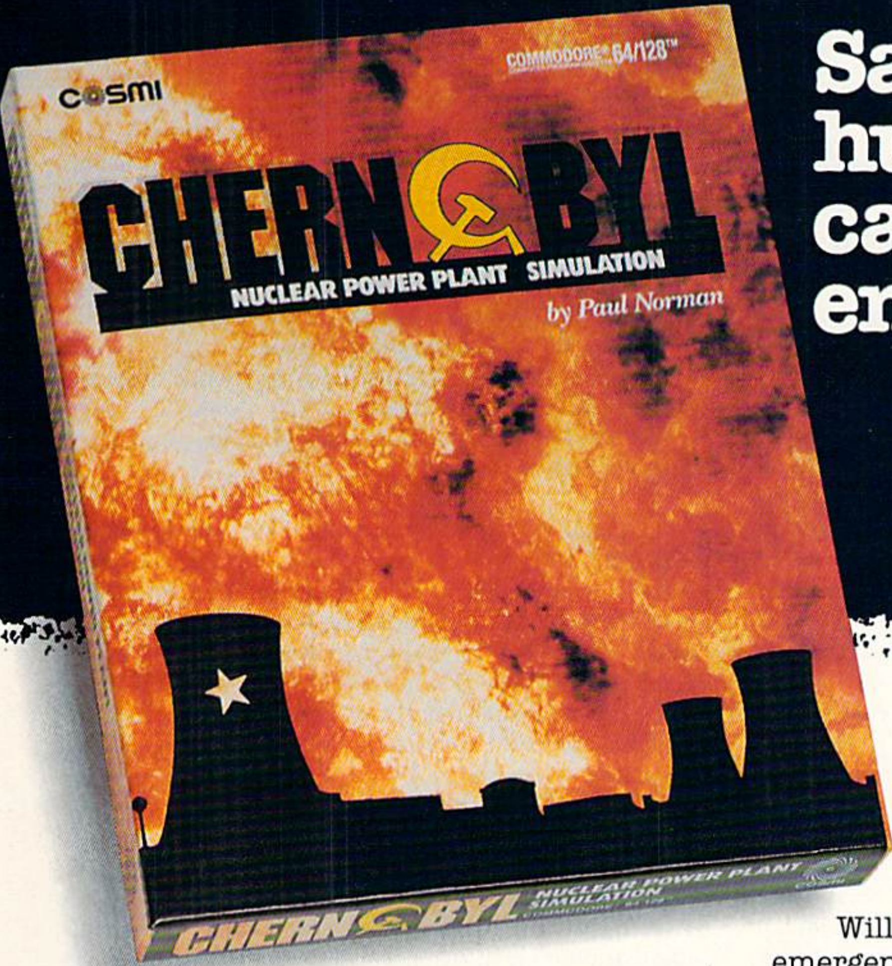
The customer's request appears in the box at lower right. Prepare the cup exactly as requested, with all the correct ingredients, then send it to the customer by rolling it all the way off to the right. If it's wrong, he'll send it back and make sure you get it right! Otherwise, the next customer steps forward and places his order.

If you can get all three cups prepared correctly in one minute, you'll have successfully survived the first day. If your time runs out before you serve everybody, you'll be fired and given a final score with accumulated days worked.

Coffee Break! is written in BASIC 7.0 and features music, sound effects, and cute screen graphics. If you can last more than six days in the game, you're a regular Baryshnikov of the goop-stained cafe floor. ☐

SEE PROGRAM LISTING ON PAGE 85

CHERNOBYL: THE SOLUTION

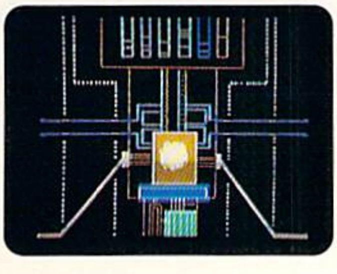


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CHERNOBYL is by Paul Norman, creator of the Super Huey flight simulator series and Defcon 5.

CHERNOBYL for C-64/128 is priced at $24.95.

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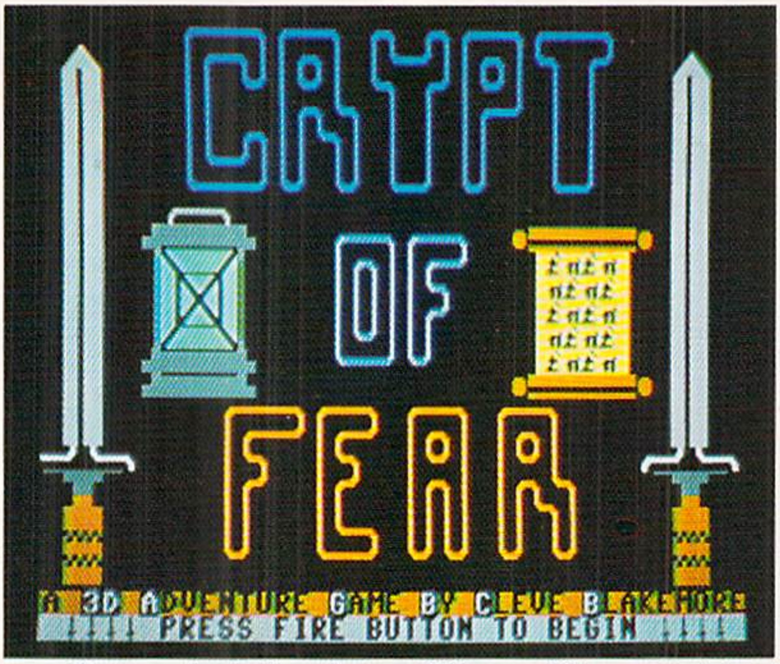


PHOTO: MICHAEL R. DAVILA

Following your epic adventure in the *Vault of Terror,* the kingdom of Sarnoth was returned to normalcy, as near as anyone could tell. You were rewarded by the king with a cottage overlooking the sea and a handsome pension for life, the remainder of which you planned to spend in retirement. Your macabre battle against the Naga, the ancient race of evil serpents which had captured the castle, somehow wearied and fatigued your soul, leaving you a tired knight-at-arms who felt there were no great challenges left in life.

You hung your enchanted sword over the fireplace mantle and left your armor to rust in the barn. Although you often jousted with neighbors for amusement, your body lost its muscle tone and became that of an ordinary laborer, robbing you of your identity as a knight.

While you rested, the world around you changed, too. Many of the old dragons were reported to have died. A wizard or sorcerer became a rare occurrence in the realm, and those that remained could perform nothing but parlor tricks. The beasts that had once blocked frequently traveled roads had retreated into the high country, ending the need for knights to escort royalty through the woodlands.

An old fisherman summed it up one night for you as you sat with him at dinner in the tavern, his hoary beard catching glints of firelight. "It's the magic, boy...it's drying up. The world has no room left for monsters and enchantment, mighty heroes and warriors. The old earth is fading away, giving up its secrets to these new men of science, with their abacus and alchemy, many numbers and ideas. The day for your kind has passed on."

And you knew then that he spoke the truth.

Many months passed in your lonely cottage before the night your door swung open, and in from the blustering cold night walked the king, accompanied by the royal guards.

While his men warmed their hands at your fireplace, the two of you sat together in the far corner.

"I know it's a lot to ask of you, son. But once again, I need your help," he said, his voice trembling as his fingers ran over the gold crown on the oak table before him.

"I don't know if you've heard the stories about a horrid demon that still dwells on the far side of Shadowthorn Mountain, deep inside a crypt built by a race long dead. There have been rumors, a few extravagant tales, but I ignored them. Superstitious villagers, I presumed. I know now that I should've looked into the matter further.

"According to the legends, this demon requires a new bride every hundred years, preferably a young virgin. He took his bride last night from the kingdom. Her screams were heard over the village as she was snatched from her bed by a great winged abomination and flown over the mountain in its claws."

Your brow knotted with apprehension. "Who was it?" you asked the old ruler.

"It was my daughter, the princess!" he sobbed brokenly, burying his head in his hands.

You strode toward the fireplace and pulled your sword from the wall.

My editor was firm on one point. He would be willing to publish a sequel to *Vault of Terror,* my 3-D adventure from the October '86 issue of *Ahoy!*, only on one condition: no more 100 block gargantuan listings. The sequel would have to require fewer than seven pages of copying in order to see print. He insisted that nobody but escaped patients from hospitals for mentally disturbed speed-typists ever wanted to copy in my agonizingly long games.

I squeezed, I crammed, I wedged. And here it is. A page-flipping, real-time adventure game in three dimensions.

If you liked *Vault of Terror*, you'll be pleased to discover that *Crypt of Fear* is to the *Vault* what the motion picture *Aliens* was to *Alien*.

Incredibly, it's not only significantly shorter, but it actually has more sprite shapes, better graphics, better music and sound effects, faster animation, and a drastically improved game scenario.

If you ever copy in a program from this magazine, copy in *Crypt of Fear.* It's the best 58 blocks you'll ever put on a disk, and the sort of thing you'll only find in *Ahoy!* Although other 3-D dungeon adventures are available commercially, you'll realize that few of them are this much fun.

The game is straightforward and simple. Find the princess inside the crypt and guide her to the exit. Fight off the hordes of slithering nasties that try to use your head for a scrub pad. Collect the sword, shield, wand, ring, crypt map, the princess's brooch, and the chalice along the way.

Kill the Demigorgon, the winged villain who inhabits the crypt.

...and do all this before the foul air inside the underground labyrinth uses up your lantern fuel and your life.

Easy, right?

The program is in BASIC and takes almost a full minute and a half to load in all the abbreviated hex data strings for the character set, sprite shapes, dungeon map, etc. Have

"... dramatic improvements over 1541 in quality and reliability ... while keeping 1541 compatibility."
COMPUTE!'s Gazette August '87

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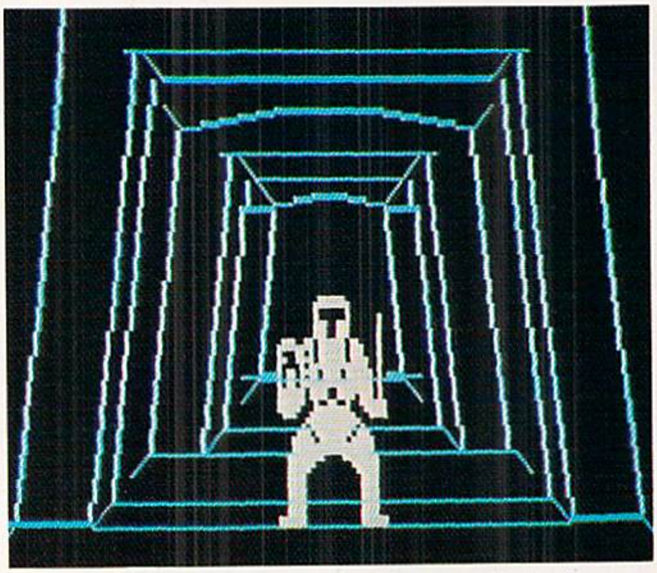
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patience, though, because it's worth the wait. As long as the screen is busy flashing or doing something, the computer is working.

Your joystick should be plugged into Port 2. Hit the fire button after the title screen appears.

As you enter the crypt, you'll pass through a short tunnel with hieroglyphs carved on both sides. Pay attention. One of these ancient carvings conspicuously resembles a floor plan, perhaps left behind by the original architects. Try to memorize it as you glance at it.

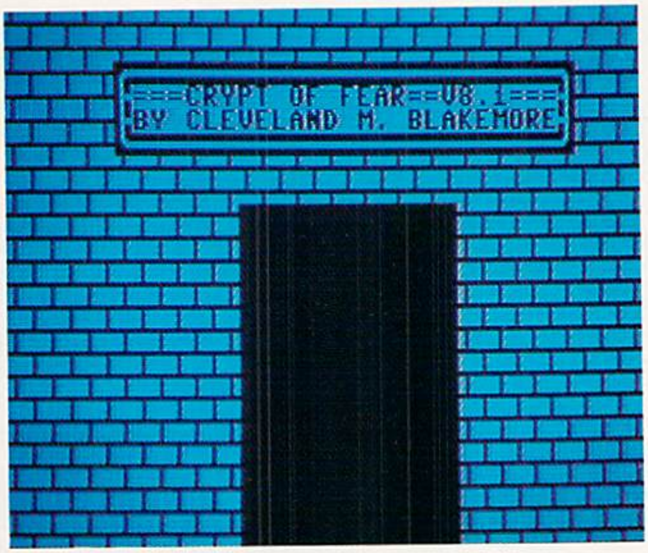
Once inside the dark crypt, you'll see nothing but a bar at screen bottom, which should be familiar to you if you've played *Vault of Terror*. This little strip is the command bar.

This bar contains small symbols, from left to right, representing the lantern, sword, shield, wand, ring, vial, map, brooch, and chalice. The last two symbols represent information, like your hit points and accumulated gold coins. Also on the command bar is your current compass direction, at the left and right.

Your only possession at the start of the game is the kerosene lantern. You'll see that it's lit up, meaning that you are now using it. Press the fire button to turn it on. The dungeon view will flare up in front of you, revealing a long, narrow hallway with several intersecting passages.

Thinking quickly, you take a rock and scratch an "X" on the wall behind you so that you'll remember where the entrance is. If you want to see it, move the joystick to the left twice to turn completely around. The "X" is only visible when you are close, but it's better than nothing.

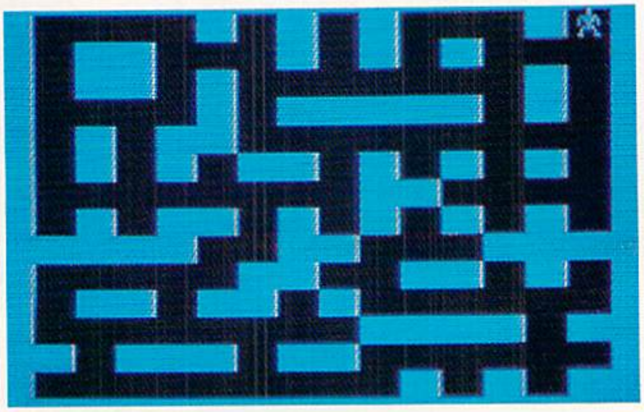
All movement is controlled with the joystick. To move forward, push the joystick forward. Push it left or right to



turn. Pull back to retreat. If you try to move through a solid wall, you'll hear a little beep as you bump your head.

To access the command bar, you must enter "command mode." Simultaneously pull back on the joystick and press the button until you see the white cursor appear. Release the fire button. The bar will light up, with all the things you are carrying in medium gray.

You can move the flashing cursor back and forth on the bar with the joystick. To PICK UP an object in front of

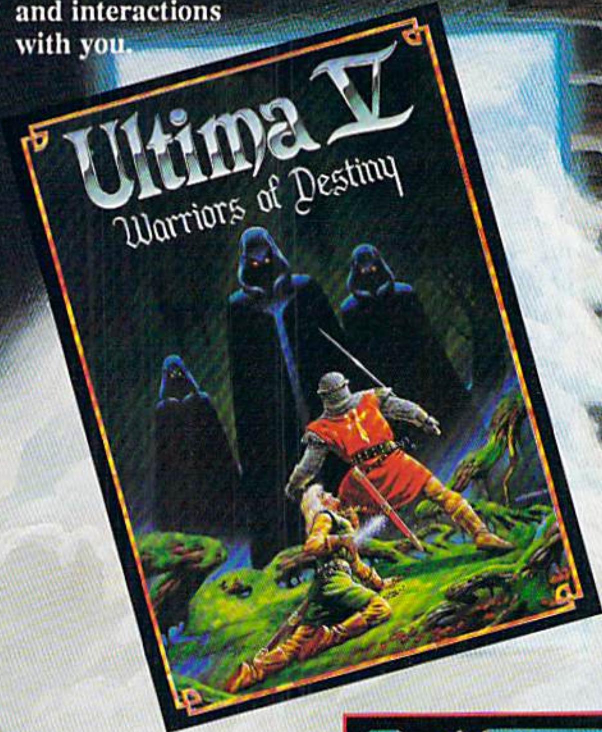


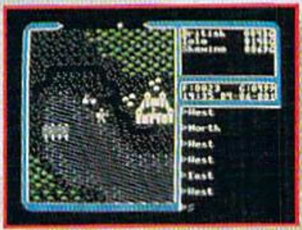
The wait is over... but the excitement has just begun.

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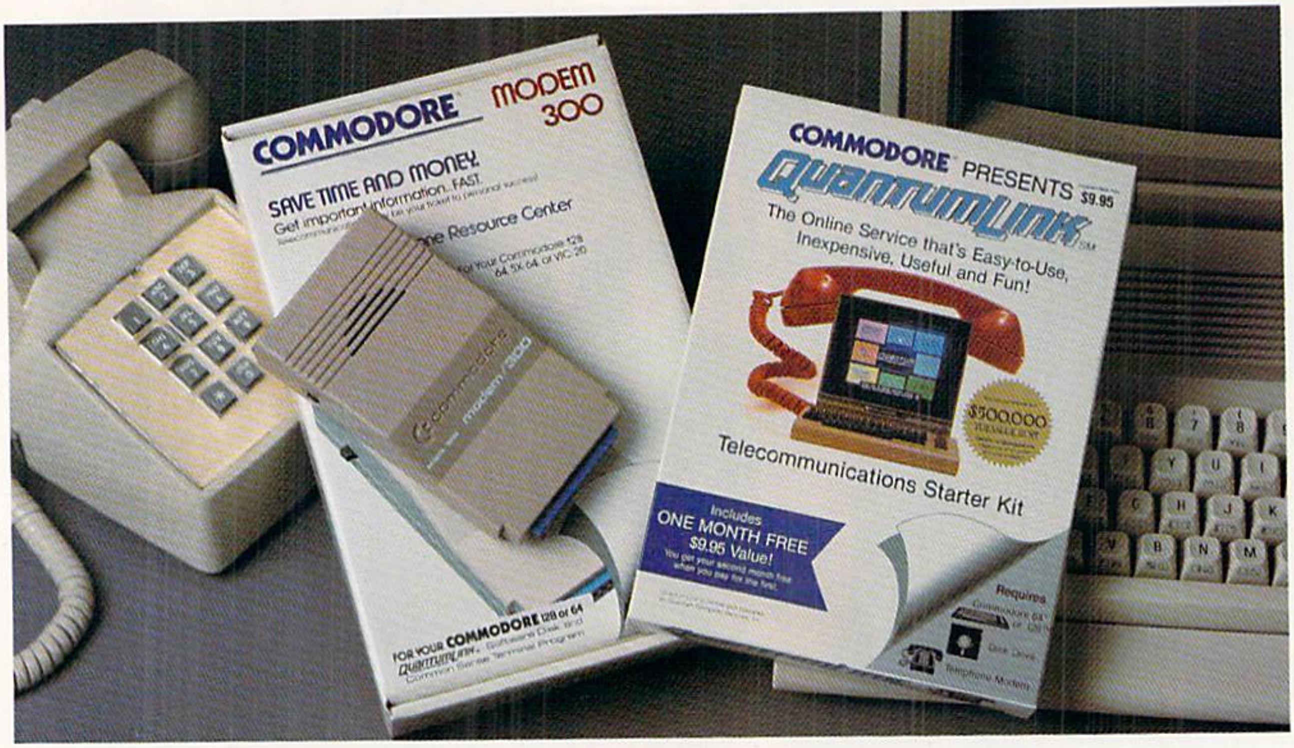


Screen displays shown from the Apple™. Others may vary. Allows the use of Ultima IV characters. No previous Ultima experience required.

Reader Service No. 240

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COMMAND BAR SYMBOLS

Lantern: cannot be dropped. Will run out of fuel and leave you in darkness if you don't get out in time.

Sword: main weapon against monsters. Better than bare fists any day.

Shield: absorbs 75% of blows.

Wand: might be a darned good weapon against powerful magical beings.

Ring: adds +2 to all hits if worn. (It is assumed to be on your finger if you pick it up.)

Vial: contains healing elixir. Use it to add 20 hit points of life.

Map: a glance at this tattered old scroll reveals where the heck you are.

Brooch: belongs to the princess. She won't leave without it. It's laying around somewhere in the dungeon, and you'll have to find it.

Chalice: you'll find this on the Demigorgon. You have to be man enough to take it away from him first, though.

G (for "Gold"): you get coins off the bodies of dead dungeon denizens, so there is a chance to get wealthy as well as save the princess here.

Beating Heart: this is your heart, so guard it well. Move the cursor here to see how many hit points you have left before some monster slugs you and sends you to that great big Adventurer's Lounge in the Sky. (Play *Dark Fortress* (January '87 *Ahoy!*) to get this joke.)

you, push the joystick UP. The bar will display the object in medium gray after it vanishes to show that you are carrying it. To DROP an object, pull the joystick DOWN. The object should disappear off the bar and appear on the floor in front of you.

Whatever is lit up in light gray is the object you are currently holding, or using. To USE an object, move the cursor to it and press the button. You are returned to the normal "fight & move mode." The object will now be in your hands, and every time you press the fire button in normal mode, you will USE this object. Normally you will probably want to walk around with the sword in your hand to be ready for monsters.

Not long after you enter the crypt, one of its gruesome tenants will be crawling in your direction, hoping for a quick snack.

If you'd like to become familiar with the slimy lineup of subterranean beasties you'll be battling, you might want to read about them in the accompanying sidebar.

Besides your LIFE reading in command mode, the border provides a clue to your health. If the border is green, you're reasonably intact. When it's yellow, you've been wounded badly. If it's red, you're tottering within a stroke of death. It's best to hide somewhere and rest up for a while when the border is red. Herein lies your advantage over the other monsters. You heal with time, whereas they do not! You can hit and run until the monster gives up the ghost.

During combat with beasts, the screen will flash red when you are hit, green when you hit them. The shade and hue of the red flash tips you off to how soundly you were struck. Orange is a love tap, light red a glancing blow, dark red a mighty stroke.

If you manage to survive all this fighting, look for the king's daughter. She's the reason you're down here.

The princess is wearing a yellow dress. You can't miss her. The only way to lead her out is by moving and then waiting for her to follow you. Make sure she is in your line of sight, or she'll get lost again.

Once you have everything on the command bar lit up (except the vial of healing elixir, because you may use it), go to the entrance with the princess in tow. When she's standing beside you, push the joystick forward (towards the "X" scratched on the wall) to leave the crypt and win the game.

The game is awfully difficult, and you may play it for a long time before you win. There is no save feature here as in *Vault of Terror,* because you won't live long enough to enjoy the sights. You have about 3400 heartbeats before your lantern fuel burns out in the polluted air and you die. Don't waste any time killing monsters for gold until you have won the game at least once. Otherwise gold fever might entomb you in the crypt forever, and the princess as well.

The listing is completely in BASIC 2.0, and anybody who thinks you can't do anything good without machine language should get an eyeful of this program. It's fast, furious, and smooth. I also have to point out that this game is *not* public domain. I've heard of people spreading *Vault of Terror* over most of North America. Last I heard, it was on bulletin boards in Australia. Such distribution of *Ahoy!* programs is in violation of federal law, and will place the distributor(s) in danger of prosecution.

I wish I could have used more REM statements to document the program, but space rules when it comes to magazine listings, so I kept them to a minimum. If you'd like a breakdown of the major routines and some extensive documentation so that you can modify the program, send a SASE to me here at *Ahoy!* and I'll get it off to you as soon as possible. □ *SEE PROGRAM LISTING ON PAGE 87*

THE BAD GUYS

Black Widow: poisonous and almost invisible in the stygian darkness. Might bite you before you even see her.

Green Cobra: these undersized *Vault* rejects are baby Nagas that hid out in the Crypt after you cleaned house on the other side of the mountain. One too many hits from one of these serpents could do a job on you.

Blue Amoeba: this shambling pile of rancid garbage is a testimony to the theory of spontaneous generation. Get him before he gets you, or the last thing you'll scream is "He slimed me!"

Red Imp: these devilish creatures came up from lower planes of the earth to hunt for humans stupid enough to go wandering around in the dark looking for virgins. You'll make their day.

Deathknights (Iron & Silver): these undead warriors are mummified zombies resurrected by the Demigorgon's powerful necromancy. They do not back down, feel pain, or ask for mercy. The ones with the silver armor are stronger and more powerful.

Green Demigorgon: if you don't pass out dead from fright when you see him, you'll probably perish after a few licks from his powerfully clawed hands. You have to be really strong to whip this guy. Period. Worst of all, you can't leave *Crypt* until you beat him and take the chalice off his hands.

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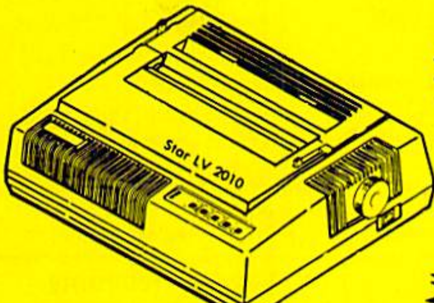
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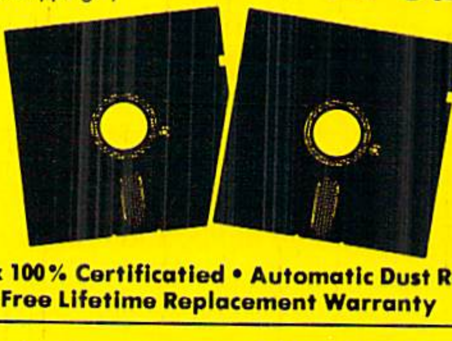
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SCREEN WIZARDRY

Magical Editor Effects on the C-64

By Cleveland M. Blakemore

The Commodore's built-in screen editor makes it the most versatile computer in the low end market. There are so many tricks, tips, and special effects that can be achieved with the editor that it would be impossible to describe them all here.

Nonetheless, there are a handful that every programmer should have in his library of subroutines, and I'll try to pass these closely guarded secrets on to you. (Even though it may be curtains for me when hackers all over the country learn that I've publicly divulged some of my most coveted gaming tricks.)

SCROLLING THE SCREEN DOWN (?)

We've all seen those arcade cheapies in BASIC that scroll the screen up. The effect is insipid, boring, and leaves no room for game information like score or players remaining.

By printing a character in the upper right corner of the screen, we force the editor to scroll all the lines beneath it down, in order to make room for a second logical line of BASIC. Then we give the screen editor amnesia by setting the high bit of the line link table at memory location 218, so that we can do it again. This leaves the first line of the screen intact for scores, titles, etc., while we move the entire screen down beneath it.

The demo program creates a scrolling star field with a solid reversed bar of text above it. Looks great, doesn't it?

COLOR BAR SCROLLING

Nothing looks better than a title screen full of pulsating color. How can you switch colors that quickly without disturbing the text on the screen?

POKE the screen editor memory location (648) into a harmless range of RAM, then print colored bars after changing the current character color. The color on the invisible screen will scroll upward while the text on the visible screen stays put. This looks terrific for explosions, too. The demo has a mushroom cloud graphic for a nuclear blast, suitable for any game with a big finale. Remember to move the editor back with a POKE648,4 before printing to the screen again.

MOVING SCREEN LINES

It's always neat to be able to move part of the screen while keeping several lines at the top or bottom untouched. You can do this in either direction, using the routines at 59888 and 59848.

Where F=line to copy from, and T=line to copy to, use the following formula:

```
POKE781,T:SYS59888:POKE172,PEEK(60656+F)
:POKE780,PEEK(216+F):SYS59848
```

The demo moves lines around randomly until you press the "X" key.

SET CURSOR POSITION

Forget about that pokey routine at 65520 (PLOT). The easiest way to set the cursor anywhere on the screen is to POKE the (Y COORDINATE)−1 into location 214, print once, then set the X COORDINATE with a TAB(X) statement. This method is the fastest and most efficient for BASIC applications. I use it throughout the demo to place the cursor anywhere I want on the screen.

SPRITE SHAPES GALORE

There are only four completely safe sprite blocks to use out of BASIC, these being numbers 11, 13, 14, and 15. How does a programmer get around these space limitations without bringing down the top of BASIC pointers to make room?

Using the screen editor, sprite shapes can be switched in and out of memory with blinding speed by printing strings containing the sprite numerical data to the sprite block.

The demo flashes some quicky garbage in and out of sprite block 13 to show you how easy this is. These shapes could just as easily have been shapes of a player's character running, or animated sequences of a bird in flight. Put your sprite shape data into an array of strings exactly 64 characters long, then flip through the shapes with the subroutine merely by changing the array index pointer. Amazing graphic effects are possible in BASIC with no memory lost to lengthy sprite data using this technique. The only limitation is that you must perform these operations in program mode with the cursor OFF; otherwise the locations will be corrupted by the flashing cursor being POKEd into and out of memory.

SIMPLE HORIZONTAL SCROLLING

This technique uses up a chunk of memory, and it's limited to about four screen lines before it becomes too slow to be effective. Notwithstanding, it's an excellent way to create a moving wraparound landscape for games. It could also be used to scroll important information across the screen, perhaps in a terminal program.

SCROLLING DIAGONAL LINES

This looks neat. Hopefully you can think of an application for it—perhaps a football game, or some kind of *Zaxxon*-type screen display. All you do is print a left slash with a cursor-down character over and over again.

Continued on page 98

RUPERT REPORT

The complex sound generator in the Commodore 64 and 128 provides a bewildering array of sound possibilities. Obtaining those sounds with BASIC 2.0 on the C-64 is a monumental task of POKEy programming. With BASIC 7.0 on the C-128 comes another problem. There are so many sound commands and parameters available, it is difficult to know where to begin.

In trying to sort out the various BASIC 7.0 sound-related commands, I came to the conclusion that a meaningful discussion of sound generation requires an overview of the physical nature of sound waves. Consequently before we explore the ways of producing sounds in BASIC 7.0, we will first discuss the physics of sound.

PHYSICS 101: WAVE THEORY

Our ears convert rapidly changing air pressures into sounds. Picture the air molecules in front of a loudspeaker being rapidly decompressed and compressed as the speaker cone vibrates back and forth. These zones of varying air pressures move away from the speaker at the speed of sound.

Just as the push and pull of ocean waves can move your body toward and away from the shore, sound waves move the fine mechanisms in your ear back and forth. These vibrating mechanisms generate small electrical signals which the brain interprets as sound.

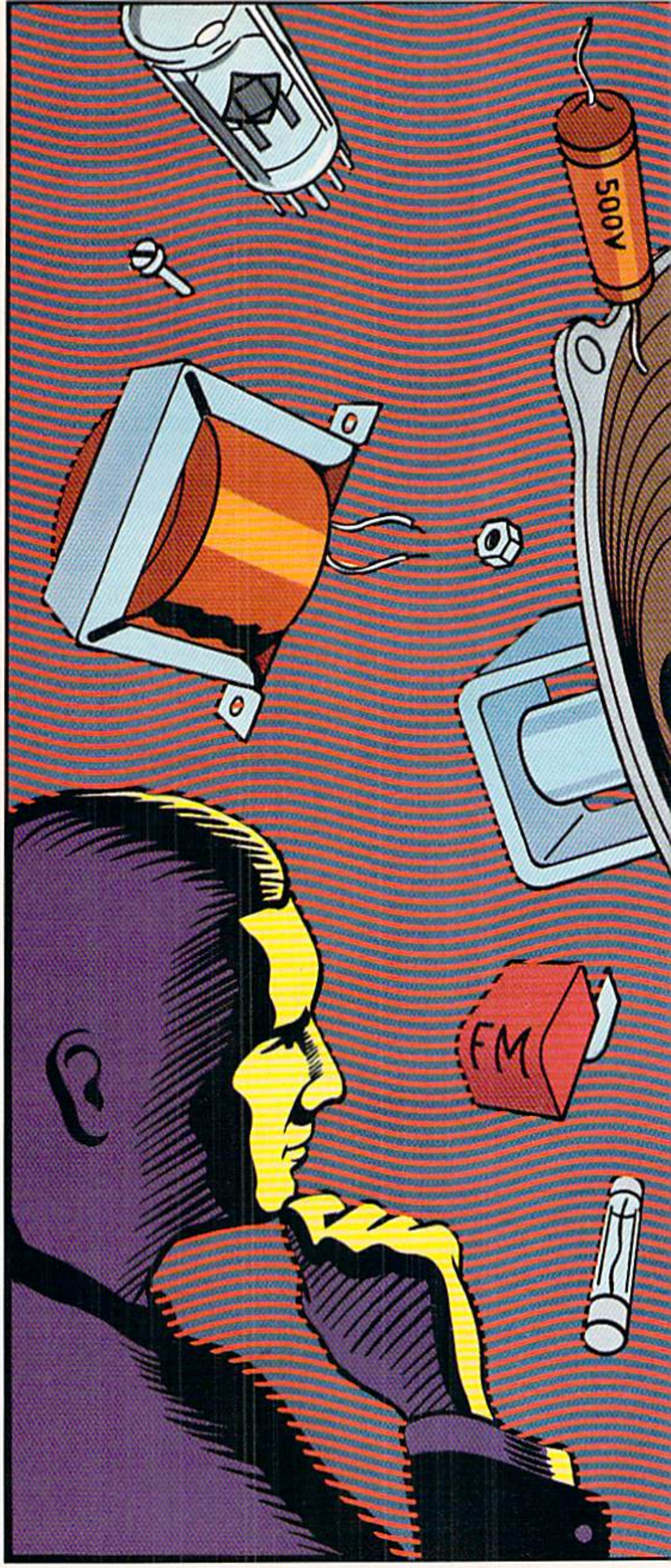
There are two basic properties of waves which are important to our discussion. Those properties are *amplitude* and *frequency*. Amplitude refers to the strength of the waves. Frequency is a measure of the rate of vibration of the waves.

The distance that a loudspeaker's cone moves back and forth determines the amplitude of the waves it generates. A speaker cone vibrating only a sixteenth of an inch forward and backward does not supply nearly as much energy to the air molecules as it does by moving an inch in each direction. Gentle ocean waves lapping at the shore cause your body to sway back and forth whereas a strong pounding surf exerts more force and may knock you over. (Our ocean wave analogies refer not to the crests of the waves which are rising and falling but rather to the horizontal movement of the water toward the shore and away from it.)

Sound waves of large amplitude cause the ear mechanisms to vibrate over a greater distance than small amplitude sound waves do. The brain interprets large movements of the ear mechanisms as loud sounds and small movements as soft sounds. Consequently this important property of sound waves is summarized:

Amplitude = Loudness

When you "turn up" the volume of your radio, you are increasing the output power of its amplifier which in turn causes the loudspeaker to move back and forth over a greater distance. If you are able to look at the center of a loudspeaker's cone, you may be able to observe this effect as you increase the volume. Lay the speaker on its back and



Sound

Investigating

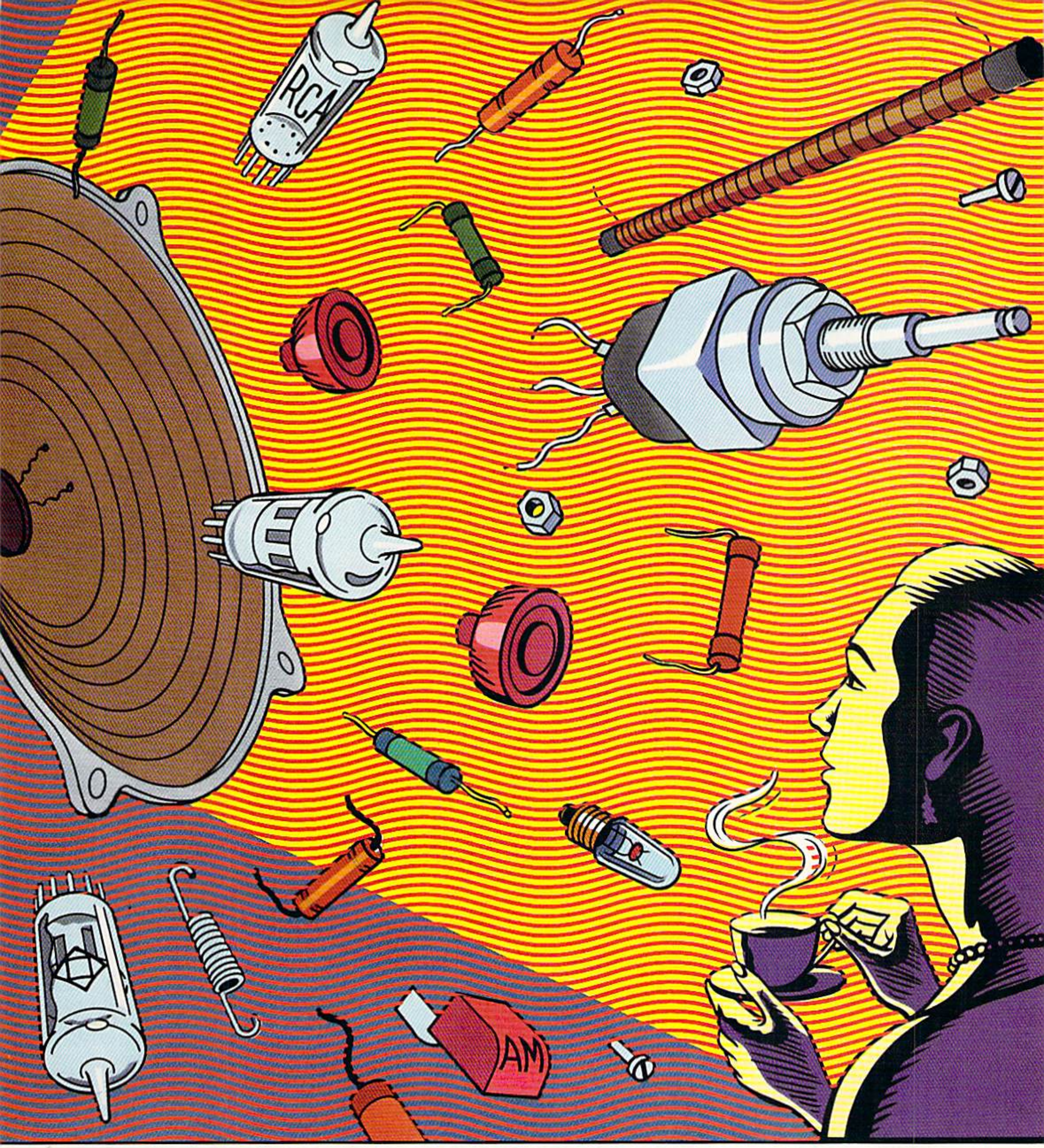


ILLUSTRATION: TOM CUSHWA

Enlightenment

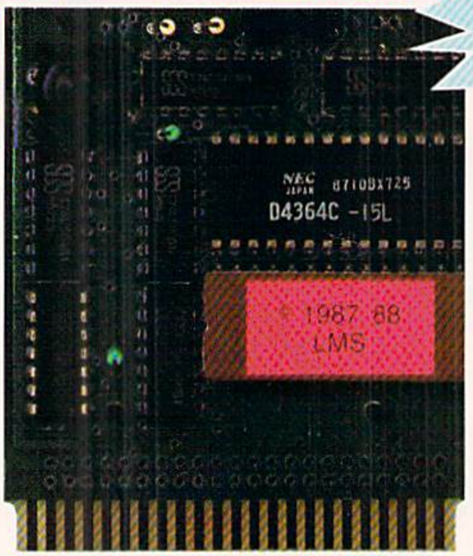
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put a small wad of paper at the center of the speaker cone. At low volumes (small amplitudes) the wad of paper moves around a little. At high volumes (large amplitudes) the force exerted by the speaker cone may be enough to bounce the paper wad right out of the speaker.

We may expand our equation above to read:

Amplitude = Loudness = Volume

These three terms refer to the same property of the sounds we will be generating.

The second fundamental property of waves we must understand is *frequency*. Frequency measures how rapidly the waves are vibrating. Hold a pencil upright from the bottom. Lean it to the left then to the right and then back to its upright position. We will consider this to be one cycle of the pencil's vibration. If you completed this motion in exactly one second, the rate of the pencil's vibration was 1 cycle per second.

Repeat the movement of the pencil but go twice as fast. Now the pencil is vibrating at a rate of 2 cycles per second. We say that the *frequency* of the pencil's vibration is 2 cycles per second or 2 Hertz. Hertz is a unit of frequency meaning "cycles per second." Typically the abbreviation of Hertz (Hz) is used in writing. In this case the pencil's frequency is 2 Hz.

Now cause the pencil to oscillate as rapidly as you can. What is the highest frequency you can obtain? Some crude timings with a stopwatch showed me that 5 Hz is about the fastest I can vibrate the pencil. Hummingbirds can vibrate their wings roughly ten times that fast, or 50 Hz.

Our brain cannot perceive any vibrations of our ear mechanisms occurring at frequencies less than 20 Hz or so. For that reason we cannot hear the waves in the air generated by the pencil's movement, but we can hear the waves produced by the hummingbird's wings. Appropriately enough, we perceive the hummingbird's sound as a low-pitched hum. (So maybe that is why hummingbirds hum!)

Mosquitoes move their wings more rapidly ("with a greater frequency") than a hummingbird does. The sound from a mosquito is a higher pitch than that from a hummingbird. The vibration of the mosquito's wings is heard as a high-pitched whine. These ideas lead to one more important relationship:

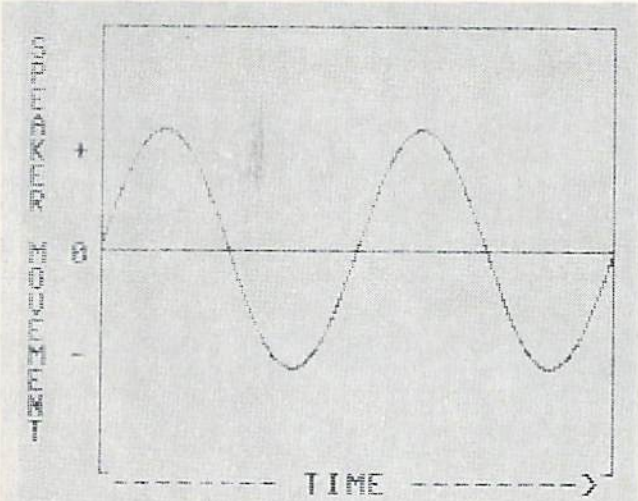


FIGURE 1 - SINE WAVE

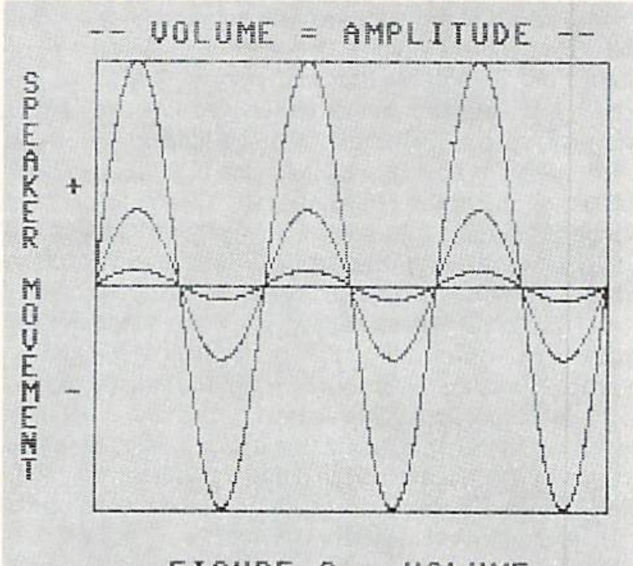


FIGURE 2 - VOLUME

Frequency = Pitch

Air vibrations at frequencies less than 20 Hz are called subsonic ("below sound"). Human ears can hear sounds with frequencies as high as 20,000 Hz or 20 kilohertz (20 kHz). Air vibrations at higher frequencies are called supersonic or ultrasonic. (Subsonic and supersonic *frequencies* here are not to be confused with subsonic and supersonic *speeds* of aircraft. Sound waves travel through air at a speed of roughly 740 miles per hour. "Supersonic speed" refers to objects which are moving faster than 740 miles per hour. Supersonic frequencies refer to waves which have a higher rate of vibration than our ears can detect.)

SEEING THE SOUND

It is useful to represent sound waves graphically. The graph in Figure 1 shows the two fundamental characteristics of a typical wave, its frequency and its amplitude. The horizontal axis of the graph is time. The vertical axis is amplitude. Think of this graph as a record of the loudspeaker cone's distance from its rest position as a function of time.

At the left side of the graph, the speaker cone was at its rest position. Then it started moving outward, shown by the plus sign. After a few moments it reached its maximum amplitude, and then it moved back to its starting position. It didn't stop there, however. It continued moving through the rest position until it reached its maximum distance in the negative direction.

This graph shows two complete cycles of the speaker's vibration. If it had completed these two cycles in one second, it would have a frequency of 2 Hz. If the graph actually represented only 25 milliseconds of time (0.025 s), the actual frequency of the wave could be found this way:

frequency = 2 cycles / 0.025 seconds
frequency = 80 cycles / second = 80 Hz

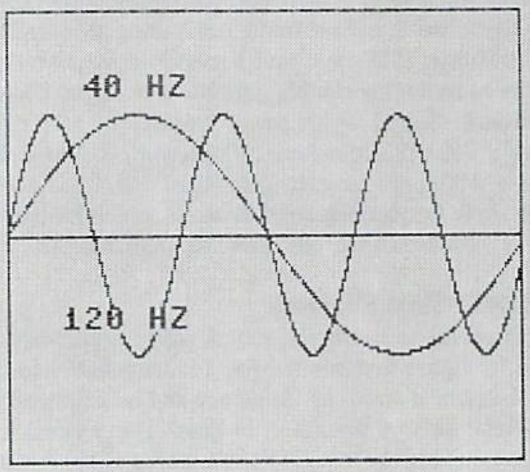
The wave is shown as a sinusoid curve (a "sine wave"). This represents the simplest and most fundamental type of oscillation. We will see later that every type of sound, no matter how complex, can be represented in terms of sine waves of various frequencies and amplitudes.

The program *Looking at Sound* (see page 82) is a brief tutorial on the nature of sound waves. The program runs on the C-128 only. It presents graphically and audibly the concepts we shall now discuss. You should reset the computer (RUN STOP/RESTORE) before running the program.

Our earlier discussions identified volume and frequency as the two most fundamental characteristics of sound phenomena. Pressing "V" in *Looking at Sound* shows graphs for a small amplitude (soft) sound, a medium amplitude sound, and a large amplitude (loud) sound, all at the same frequency. Look at the screen dump in Figure 2. Think of the graph as showing a slow motion representation of the speaker cone's movement from its initial rest position. You can tell from the graphs that the frequencies of the three waves are the same, since they all complete three cycles in the same amount of time.

When you press "F" you will see the graphs shown in Figure 3. Both waves have the same amplitude but different frequencies. The 40 Hz wave completes one cycle in 25 milliseconds while the 120 Hz wave completes three cycles in the same time (3 cycles / 0.025 ms = 120 Hz).

-- FREQUENCY = PITCH --



<-=-=-= 25 MSEC =-=-=->

FIGURE 3 - FREQUENCY

QUALITY OF SOUND

In addition to loudness and pitch, sound has a characteristic called "quality" or "timbre." A saxophone and a trumpet may both play the same musical note with the same loudness, yet the two notes are distinguishably different. The quality of sound depends upon its harmonic content. Let's discuss this concept of harmonic content.

A sine wave is a simple waveform. A square wave is a complex waveform. The sine wave consists of a single frequency or harmonic. A square wave is made up of infinitely many frequencies, all added together. A square wave is very rich in harmonics. This may sound contrary to common sense, especially to people who work in the digital domain. After all, what could be simpler than switching a speaker

-- QUALITY = WAVEFORM --

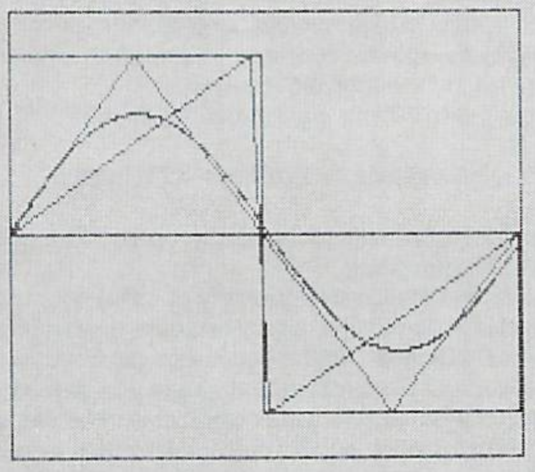


FIGURE 4 - QUALITY

on and off with a square wave signal?

Indeed generating a square wave digitally is much easier than generating a sine wave, but consider what the speaker must go through to respond to such a signal. Initially it is at its resting position. At the next instant it is supposed to jump to its maximum distance in one direction and stay there. Some time later, it must instantaneously jump backwards to the maximum distance in the other direction.

It is impossible for a physical object to oscillate with a square wave motion. Why? Because it always takes some time to get the object moving from its rest position. Once it has reached the maximum distance, it takes some time for it to slow down and stop there. Square wave motion allows *no* time for the transitions from one position to another. At best, a physical object can only approximate square wave motion.

Sinusoidal motion (movement following a sine wave graph) is the natural motion of freely vibrating physical objects. Look at the graph of the sine wave in Figure 1. The movement which the speaker cone must exhibit is very smooth. It has some time to reach its maximum distance.

- SQUARE WAVE PULSE WIDTH

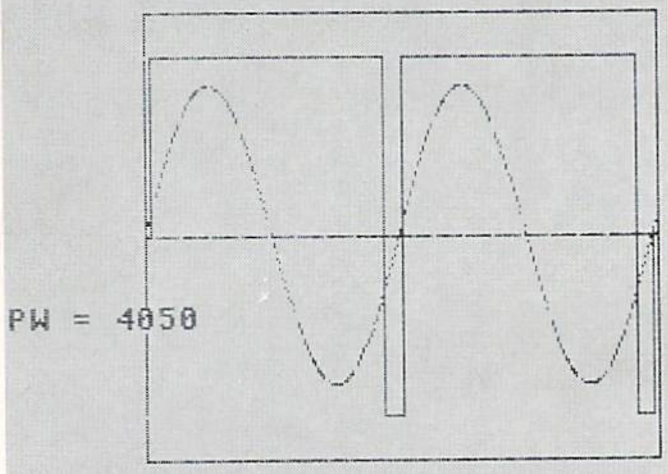


FIGURE 5 - PULSE WIDTH

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Once it is close to the maximum distance, it takes its time slowing down. Then it gradually starts speeding up as it begins moving in the other direction.

Go back and analyze the motion of the pencil you vibrated earlier. When you vibrate it rapidly, the motion is smooth and continuous, not jerky and instantaneous. In fact you will find it very difficult to make the pencil follow square wave motion. At the extremes of its journey when you try to stop it, it vibrates slightly rather than stopping instantly.

Hopefully this discussion makes it somewhat more believable that sinusoidal motion is simple and natural. When you generate a sound with a sinusoidal waveform, the sound is pure, smooth, and flutelike. A square wave sounds richer, raspier, and in some sense fuller. The sound qualities of the two waveforms are different. We will see in a future article how to create a square wave by adding sine waves of different frequencies together. We will also see how it is possible to filter out many different sine waves from a square wave and end up with a single sine wave.

Since the square wave is composed of many frequencies, we say that the square wave is "rich in harmonics." "Harmonic" is a fancy name for a multiple of some fundamental frequency. Consider a 50 Hz sine wave. A note which is one octave higher has a frequency of 100 Hz. If we add the two sine waves together, we end up with a somewhat lumpy waveform. We say that the waveform is composed of a fundamental frequency (50 Hz) and its second harmonic (100 Hz). The relative amplitudes and their occurrence in time with respect to each other also affect the resulting shape of the waveform and the sound we hear.

The Commodore sound generator produces three "musical" waveforms in addition to a "noise" waveform. The musical waveforms are called the Triangle Wave, the Sawtooth Wave, and the Square Wave or Variable Pulse.

If you press "Q" in the *Looking at Sound* tutorial, you will see shapes of these three waveforms superimposed upon the fundamental frequency sine wave. You can see in Figure 4 that the three waveforms have the same basic frequency as the sine wave. They all complete one cycle in the same amount of time.

You can also see in the program and in the figure that, of the three, the triangle wave is the closest approximation to the basic sine wave. In fact, in the program you can hear that the triangle wave sounds rather smooth compared to the harsher-sounding sawtooth and square waves. All three waveforms contain harmonics besides the fundamental, but the harmonics in the triangle wave are not as pronounced as in the other waveforms.

Besides selecting one of three basic waveforms, it is possible to specify the pulse width of the square wave. Press "P" in the *Looking at Sound* program or look at Figure 5.

A true square wave is equally divided. The speaker cone spends as much time in the positive direction as it does in the negative direction. By varying the pulse width, it is possible to change the relative amounts of harmonics in the square wave, thereby changing its sound quality.

Figure 5 shows two cycles of the fundamental frequency and of the corresponding square wave with a very large pulse width value. The maximum pulse width value for BASIC 7.0 is 4095. A pulse width of 4050 as shown in the figure means that the speaker cone spends 4050/4095ths (99 percent) of its time in the positive direction. It very briefly "bounces" in the opposite direction before returning. The sound produced by this waveform is very thin and tinny, just as the graph might imply.

If you run the program, notice that when the pulse width is 2050 (approximately 50 percent), the sound is much more rounded and flutelike than the other pulse widths. With that pulse width, it is most similar to the underlying sine wave.

You may also notice that a pulse width of 550 (13 percent) sounds the same as 3550 (87 percent). The only dif-

SOUND CHARACTERISTICS AFFECTED BY BASIC COMMANDS

	Characteristics Affected				
COMMAND	Base Frequency	Frequency Range	Volume	Quality	Duration or Repetition
I. SOUND 1) Voice					
2) Frequency	X				
3) Duration					X
4) Step Dir.				X	
5) Min. Freq.		X			
6) Step Size				X	
7) Waveform			X	X	
8) Pulse Width			X	X	X
II. PLAY 1) Voice					
2) Octave	X	X			
3) Envelope			X	X	
4) Volume			X		
5) Filter		X	X	X	
6) Notes	X				X
III. ENVELOPE 1) Number			X	X	
2) Attack			X	X	
3) Decay			X	X	
4) Sustain			X	X	
5) Release			X	X	
6) Waveform			X	X	
7) Pulse Width			X	X	
IV. FILTER 1) Cutoff Freq.		X	X	X	
2) Low Pass		X	X	X	
3) Band Pass		X	X	X	
4) High Pass		X	X	X	
5) Resonance		X	X	X	
VI. TEMPO 1) Speed					X
V. VOL 1) Volume			X		

SUMMARY OF BASIC SOUND COMMANDS

I. SOUND *voice, frequency #, duration,* step dir., min. freq., step size, waveform, pulse width

1) voice: 1 2 3
2) frequency #: 0...65535; (freq. #=Hz * 16.4; also see PRG p. 367)
3) duration: 0...32767; (duration=60 * number of seconds)
*4) step direction: 0=up, 1=down, 2=up & down [default=0)
*5) minimum freq.: 0...32767; (value=Hz * 16.4) [default=0]
*6) step size: 0...32767; (value=Hz * 16.4) [default=0]
7) waveform: 0=triangle, 1=sawtooth, 2=square wave/pulse, 3=noise [default=2]
8) pulse width: 0...4095 [default=2048, square save] (used only with waveform=2)

*used for sweeping through a range of frequencies between the base frequency (item 2) and the minimum frequency (item 5).

NOTE: PLAY, FILTER, and VOL affect SOUND. To enable FILTER for voice 1, use PLAY"V1 X1" before the SOUND command. Use V2 or V3 for other SOUND voices.

II. PLAY "voice, octave, envelope, volume, filter, notes"

1) voice: V1 V2 V3
2) octave: O0=low...O6=high
3) envelope: T0...T9 (uses parameters given by ENVELOPE command)
4) volume: U0=silent...U15=loud (overrides the VOL command)
5) filter: X0=off, X1=on (uses filter defined by FILTER command)
6) notes: # (sharp), $ (flat); S (1/16), I (⅛), Q (¼), H (½), W (whole); (dotted); A...G (pitch); M (end of measure); R (rest)

III. ENVELOPE *number,* attack, decay, sustain, release, waveform, pulse width

1) number: 0=piano 1=accordion 2=calliope 3=drum 4=flute 5=guitar 6=harpsichord 7=organ 8=trumpet 9=xylophone
*2) attack: 0...15 (times are from 2 ms to 8 s; see *PRG* p. 362)
*3) decay: 0...15 (times are from 6 ms to 24 s; see *PRG* p. 362)
*4) sustain: 0...15 (0=decay to 0 amplitude, 8=decay to ½ amplitude, 15=stay at full amplitude reached during the attack)
*5) release: 0...15 (times are from 6 ms to 24 s; see *PRG* p. 362)
*6) waveform: 0=triangle, 1=sawtooth, 2=square wave/pulse, 3=noise, 4=ring modulation
*7) pulse width: 0...4095 (used with waveform=2)

*default values set by Envelope number (item 1); see *PRG* p. 337

Note: ENVELOPE does not affect SOUND command.

IV. FILTER cutoff frequency, lowpass, bandpass, highpass, resonance

1) cutoff frequency: 0...2047 (30 to 12,000 Hz)
2) lowpass: 0=off, 1=on
3) bandpass: 0=off, 1=on
4) highpass: 0=off, 1=on
5) resonance: 0...15 (smoothest...sharpest cutoff

Note: enabled or disabled by PLAY "X1" or "X0" command.

V. TEMPO *speed*

1) speed: 0...255 (speed=4.805 * (# of quarter notes per second))

Note: TEMPO affects only PLAY command.

VI. VOL *volume*

1) volume: 0...15 (softest...loudest)

Note: VOL can be overridden by PLAY "U" command.

General Notes: Underlined parameters are required. Others are optional. *PRG* refers to *C-128 Programmer's Reference Guide.*

ference is that the speaker cone is in the positive direction 87% of the time in one case, and negative 87% of the time in the other.

CREATING SOUNDS

Now we have covered the fundamental properties of wave motion and sound. Being able to picture the various waveforms and wave characteristics will make it easier to figure out how to create the types of sounds we want. BASIC 7.0 on the Commodore 128 provides plenty of commands for specifying sound parameters. At first glance, it seems that there are too many commands and parameters to comprehend.

Most of my confusion about the sound commands was in not knowing which ones affected which others. There are only six BASIC commands: SOUND, PLAY, ENVELOPE, FILTER, TEMPO, and VOL. It was not clear from the documentation whether FILTER affects SOUND (it can) or whether SOUND is influenced by ENVELOPE (it is not). Experimentation showed that SOUND is affected by the PLAY, FILTER, and VOL commands, but only under certain sets of circumstances.

In order to reduce my confusion, I created the chart "Sound Characteristics Affected by BASIC Commands" as an overview of the effects of each command and every parameter. The chart lists five characteristics of sound across the top. It lists all commands and parameters down the left side. The chart shows an "X" beside each command parameter in the appropriate column(s) which are affected by that parameter.

Some of the information in the chart is subjective. For example, the minimum frequency parameter of the SOUND command does have an effect on the quality of the sound, but that is not its main function. The pulse width value should only change the quality of the sound, but as we have seen (or heard), the volume of the sound changes significantly as well.

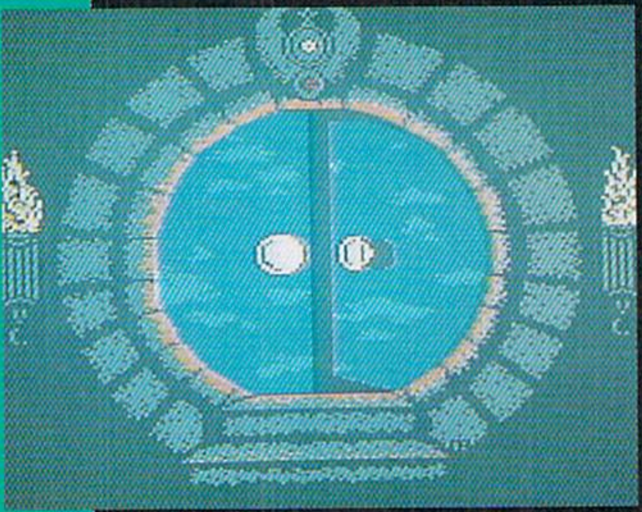
We have not yet mentioned "voices." The Commodore sound generator has three voices. Think of these as three separate instruments in the band. We may independently specify the full range of parameters for each of the three voices. There are no X's beside either of the voice parameters. The voice parameter is simply an index number. We use the other sound parameters to define three different instruments, voice 1, voice 2, and voice 3.

A second chart, "Summary of BASIC Sound Commands," is even more useful in sorting through the various sound parameters.

Continued on page 61

ART GALLERY





Art Gallery Disk Sale

Selected *Art Gallery* images are available on disk. Multicolor images are supplied in *Koala* format, while high-resolution images are in *DOODLE!* format. Included are a slide show for easy viewing, along with a bit map dump for your 1525 printer or properly interfaced equivalent. A sample *Art Gallery* disk with slide show and printer dumps is $10; or send a stamped and self-addressed envelope (business size) for a listing of available *Art Gallery* collection disks. Prices shown are for US and Canada. All others add $3 per disk. New York State residents please add appropriate sales taxes. Disks may be ordered from Morton Kevelson, P.O. Box 290260, Homecrest Station, Brooklyn, NY 11229-0005.

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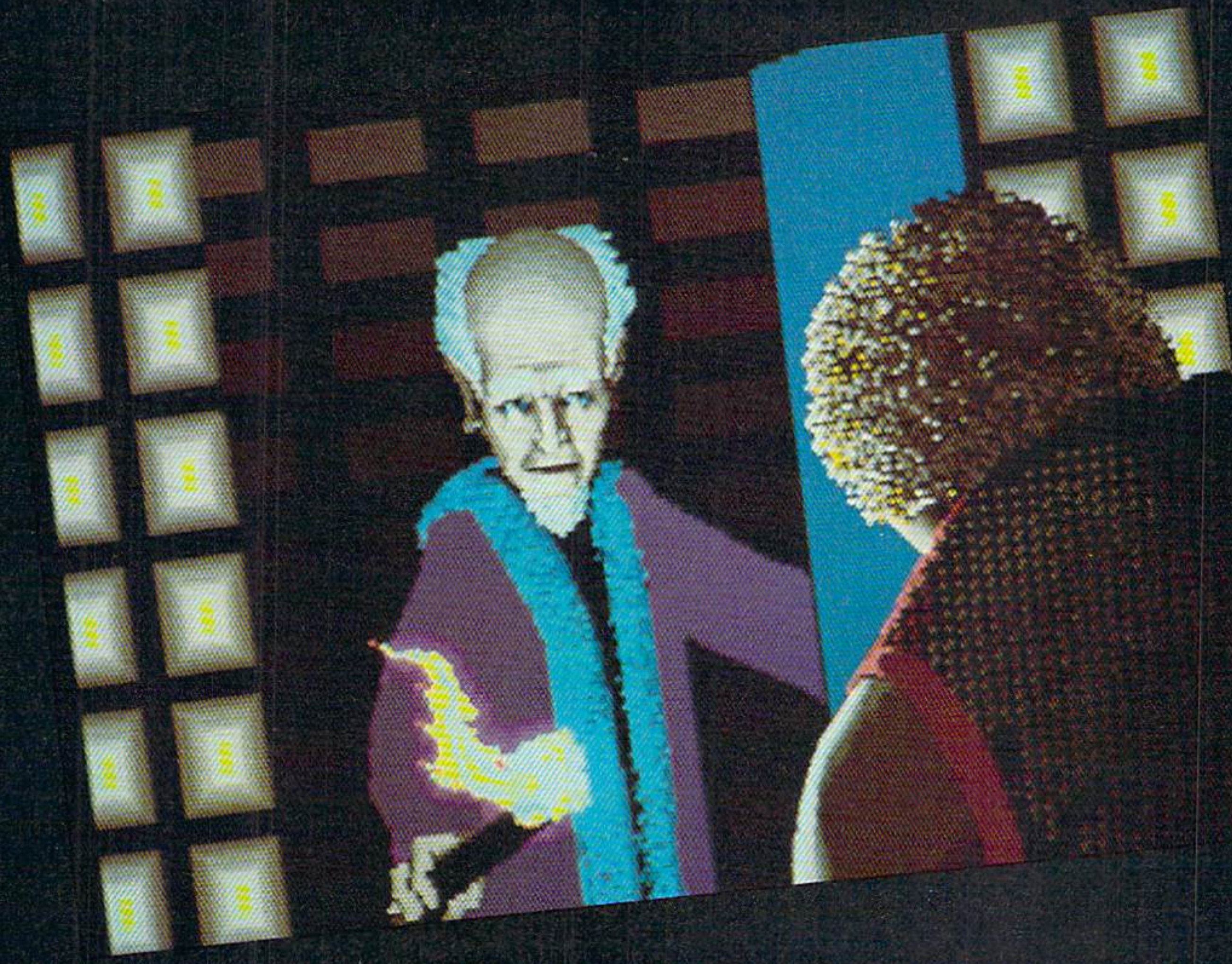
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You're holding a priceless artifact in your hands! After all, art historians will someday treasure the computer-generated graphics of today as relics of an age. But the disk files of these images are not likely to remain intact for centuries. All that will remain is hard copy—like these monthly *Art Gallery* spreads. So save your *Ahoy!'s*...you'll make a killing in a few hundred years!

Long Ago **and not so far away—directly to the left—is a CADPIC image by Gerald J. Abear (Las Cruces, NM). Above, *Koala* artist David Cancilier (Schaumburg, IL) takes us on a *Space Flight*, and Doug Barnett (Mountain View, CA) gives us *The Gate*, conjured up on *Sorcerer's Apprentice*. Filling the facing page are two *Deluxe Paint*ed Amiga images: *Night Visit* by Glenn S. Adkins (Palm Beach, FL) and *So Real Landscape* by Kiernan Holland (Roanoke, TX).**





Featured This Month:

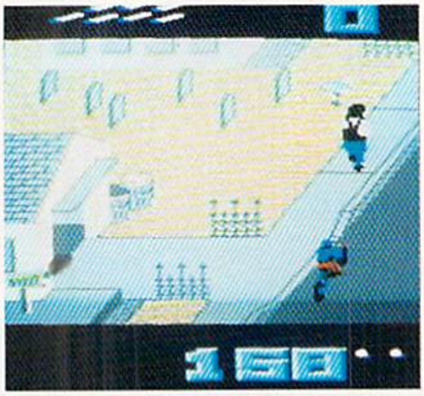
PAPERBOY
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Paperboy is the long-anticipated Commodore 64 translation of the Atari coin-op cult classic in which the player guides a bicycle-riding entrepreneur through paperboy hell. The delivery route is all suburban serenity on the surface–"Leave It To Beaver" driveways, basketball hoops bolted to the garage. But beneath this innocent-looking exterior lurks a gauntlet of paperboy perils–darting cats, kids on tricycles, rolling tires–plus everyday obstacles like traffic, curbs, and sewer gratings.

The player guides his surrogate paperboy via five simple joystick commands–speed up, slow down, turn left, turn right, and throw paper–along the delivery route. The objectives are similarly straightforward: make deliveries to the yellow houses (subscribers), break the windows on the nonsubscriber domiciles (you are apparently delivering newspapers for the Mafia), and avoid the obstacles. But be careful not to miss any of the subscribers' homes–this paper's readers are an unforgiving lot and will not hesitate to cancel delivery after even a single miss.

There are obstacles everywhere: little kids practicing for the demolition derby circuit, frenzied animals obsessed by the idea of doing a kamikaze under your wheels, and motorcycle gang outcasts so disagreeable they not only linger at the crosswalks in hopes of running down anything smaller than themselves but will actually turn around the come back for a little gratuitous vehicular homicide. From the petty to the potentially lethal, this neighborhood is crawling with such traps and snares, and the paperboy's only defense is avoidance.

Paperboy is broken down into days. At the end of each successful work period (that is, if the player survives), the player gets an opportunity to hone his skills at a practice course. These bonus rounds let the player pick up extra points by hitting the targets that line the street. At the conclusion of this run, point totals are displayed on a summary screen.



Paperboy: *hell on twenty inch wheels.*
READER SERVICE NO. 289

The graphics are nice enough, but don't approach the vibrant visuals of the coin-op original. *Paperboy* uses an unusual perspective in which the player moves along a vertically scrolling playfield, seen from a realistic three-quarter perspective–like a cinematic traveling crane shot in which the elevated camera is positioned about ten feet behind the player surrogate. This viewpoint is faithfully reproduced, but the background graphics have a pale, somewhat flat look which gives the game a humdrum appearance. Moreover, this entire package has a rushed feel to it. The only documentation is a double-sided card containing loading instructions, a control diagram, and two quick paragraphs on playing the game. When the newspaper page appears at the end of an unsuccessful game, it features nonsense filler copy rather than an actual story commenting on the player's failure.

Needless to say, the coin-op's famous handlebar controller is also missing, but the bike responds nicely to joystick commands.

Paperboy for the C-64 is still an entertaining game, but arcade partisans may be disappointed.

Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062 (phone: 312-480-7667).

–Bill Kunkel and Joyce Worley



Defender of the Crown *for the 64 offers a more fully developed strategic level than its Amiga predecessor.* *READER SERVICE NO. 290*

DEFENDER OF THE CROWN
CinemaWare/Mindscape
Commodore 64
Disk; $34.95

Kellyn Beeck's brilliant *Defender of the Crown* made its debut for the Amiga last year and reaped universal praise. At the time, cynics doubted that owners of the Commodore 64 and 128 would ever get to enjoy this arcade strategy game loosely based on Sir Walter Scott's "Ivanhoe."

Well, those skeptics reckoned without the resourcefulness of CinemaWare.

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Their talented design team has not only brought *Defender of the Crown* to the C-64 game screen, but it has actually improved on the original design!

The player assumes the role of one of four Saxon nobles. Each character has a different blend of leadership, dueling, and jousting abilities.

As one of the six great lords vying for control of the country, the computerist attends tournaments, raids neighboring castles, rescues fair ladies, commands the army, and generally works toward the reunification of battle-ravaged England.

The legendary Robin Hood and his merry band, patriots all, are willing to help the player achieve the goal, but their limited power must be used judiciously. Robin can only lend a hand twice during the whole game, so a wise strategist reserves this option for moments of dire need.

Impossible as it seems, the C-64 version has a more fully developed strategic level with a greater number of variable elements than the Amiga version. Dozens of little improvements, easy to overlook individually, combine to make this the best-playing version of the game available today.

The designers have revised and enhanced just about every phase of *Defender of the Crown*. For example, each province now contributes a specific number of vassals and amount of taxes to the lord who occupies it. This gives the player a lot more to ponder before purchasing a campaign army and sending it out to unify Britain under the Saxons by force of arms. The would-be conqueror must choose among provinces which may be important geographically and those who can provide either men to fight or the money to buy catapults and castles.

Defender of the Crown, despite the intriguing background, depends primarily on its arcade games. The designers have upgraded the mini-games tremendously.

In the joust, the player not only aims the lance at the exact center of the opponent's shield, but must now press the button to thrust the weapon at the instant of impact to unseat the rival mounted knight. The old play-mechanic required a lot less skill and, for that reason, was less challenging.

The siege system is also better on the C-64 than the Amiga. The attacking force now has a choice of ammunition for the catapult. Depending on the situation, the costly but powerful weapon can throw Greek fire, disease bombs, or boulders.

The Amiga siege is merely a race against time to knock down a wall by hitting it with rocks. The C-64 version lets the attacker choose between trying to destroy the defensive power the fortress contributes to the province in which it is located or reducing the defending garrison.

While it is too much to expect the audiovisual effects to be as good as on the Amiga, few other Commodore games rival the sights and sounds of *Defender of the Crown*. Programmers have learned some new tricks while adapting products created for the Amiga to the C-64. The musical score sounds beautiful, and some of the full-screen illustrations will make jaded Commodore owners rub their eyes in disbelief.

CinemaWare has made an outstanding game even better and, in the process, has created a classic. It is indisputably a landmark in the history of C-64 entertainment software.

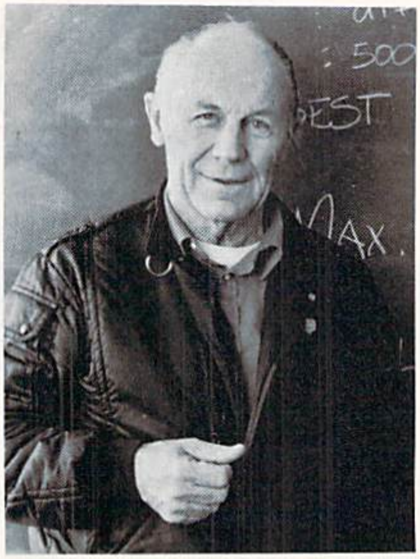
Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062 (phone: 312-480-7667). *–Arnie Katz*

CHUCK YEAGER'S ADVANCED FLIGHT TRAINER

Electronic Arts
Commodore 64
Disk; $34.95

Saddle 'em up, barnstormers, there's finally a new flight simulator that's worth getting excited about. Ned Lerner and General Chuck Yeager's *Advanced Flight Trainer* produces a realistic simulation with plenty of user options and first rate graphics.

AFT fields a selection of 14 different aircraft, including a trio of "Experimental" planes. There's a single four cyl. engine Cessna 172 Skyhawk and a Piper Cherokee; a Douglas X-3 Stiletto with two turbojet engines; a Bell X-1, another rocket plane; an F-16 Fighting Falcon and the F-18 Hornet; Lockheed's SR-71, a supersonic reconnaissance jet; a P-51 Mustang (the best fighter of WWII); and the British Spitfire. There's even a Sopwith Camel for all the Snoopy and/or Red Baron fans.



Chuck Yeager offers onscreen advice.
READER SERVICE NO. 292

The Experimental aircraft are an XPG-12 Samurai (described by Yeager as a "test pilot's fantasy"); the Hilleman Ltd. XRH-4 MadDog ("a test pilot's nightmare"); and Lerner Aeronautics XNL-16 Instigator ("...never built, and after flying it you know why.").

Once the user chooses his wings, he selects among the flight options: Intro Flight (Demo), Test Flight, Airplane Racing, Formation Flying, and Flight Instruction.

In the Test Flight mode, the user can take out any of the 14 aircraft for any period of time. The objective for the Commodorian test pilot is to discover the capabilities and limitations of that vehicle.

Airplane Racing is exciting stuff, with five courses, each of which calls for a specific aircraft over a customized gate layout. (The Slalom is flown in the Avion Spad while the 2MileBox course tests the Spitfire.)

Formation Flying lets users try the fancy stuff, the stunt flying or "aerobatics" barnstormers have loved since the earliest days of flight.

AFT uses the joystick as its primary device to control ailerons and rudder, augmented by a series of keyboard commands controlling the speed and the views. In addition to the traditional views (tower, cockpit, belly, rear, chase plane), *AFT* adds a "Satellite" overview. There's also a zoom function, plus an instant replay command for checking out one's aerobatic perfor-

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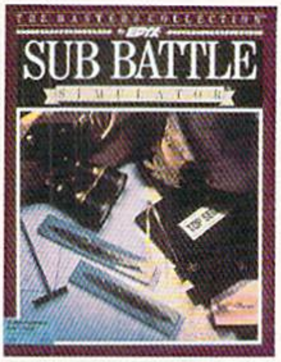
The visuals do not include the geographic and man-made attractions found in *Flight Simulator II.* Instead, *AFT* is set in a scenically uncomplicated test area. Happily, there's a compensation for fliers, since the simplicity of the graphics allow for greater detail in their visual presentation.

This quality program comes with a command sheet in addition to its detailed, well-written documentation. Especially welcome are the comments by Gen. Yeager, which add an earthy realism to the proceedings.

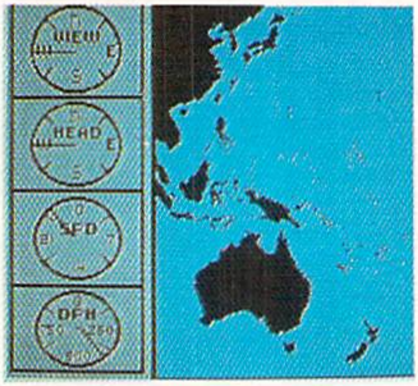
Advanced Flight Trainer has just about everything but a combat mode – a combat trainer, according to publisher Electronic Arts, will be turning up on software shelves before very long.

Chuck Yeager's Advanced Flight Trainer is the most entertaining product of its type since *Flight Simulator II* (SubLOGIC). It's highly recommended for would-be hotdogs, Sunday afternoon flyers, and computerists with "The Right Stuff."

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404 (phone: 415-571-7171). *–Bill Kunkel*



Features practice, wartime command, & single mission modes.
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SUB BATTLE SIMULATOR
Epyx
Commodore 64
Disk; $39.95

It's hard to get excited about a submarine simulator in light of the many fine programs of that type already in the marketplace. Digital Illusions' *Sub Battle Simulator*, however, is such an impressive package it will bring even veteran U-Boat commanders to the surface for a look-see.

Sub Battle Simulator, a circa World War II submarine simulation, has three play modes: target practice, single mission, and wartime command (the entire war). The program includes 60 different missions, 24 American and 36 German. The submarines are limited to the territories they actually patrolled, so while German subs traffic mainly in the North Atlantic, the American undersea ships can engage the Germans or the Japanese. The instruction booklet cites the accuracy of the American missions but admits to greater latitude with the German runs, as all their records were destroyed at the end of the war.

One especially nice feature is "Time Compression," which allows subs to travel great distances without a corresponding delay in "real" time. The save/restore command is also a welcome option for gamers who don't complete their goals in one play session.

The main screen consists of gauges (view, heading, speed, depth) set in a vertical strip at the left side of the screen, control commands (for deck guns, torpedo launch, dive, run silent, etc.), a Crew Speech Display (where crew members respond to commands and report on damage and hits), and a View Display Window. The VDW shows the scene through a periscope, through binoculars, and from the tower, sonar display, radar screen, map display, side display (a silhouette rendering of the immediate area), and status readout.

The graphics are quite sharp and the multitude of views permits total visual, sonar, and radar access to enemy ships (which are also depicted in the excellent and thorough documentation).

Sub Battle Simulator is a state of the art combat simulator that is comparable – and in some cases, superior – to any other submarine program ever developed for the Commodore.

Epyx, P.O. Box 8020, Redwood City, CA 94063 (phone: 415-366-0606).

–Bill Kunkel and Arnie Katz

ML RANGER

Object Code Relocator for the C-64

By John Fedor

It happens occasionally. Your machine language program exceeds the area of its original memory location. Your assembler doesn't allow for a relocation of the program. What can be done? One of three things. One, painstakingly relocate all the JMP, JSR, and other commands based inside your program. Or two, decide that it's hopeless and trash the program and all your effort. Or third, use *ML Ranger.*

With this program, you can easily relocate an ML program or routine to a new location in a matter of seconds. Just enter the program using *Flankspeed* (see page 81), save it to disk, enter SYS 49152, and answer three simple questions: where is the start of your program/routine, where does it end, and where would you like it to be relocated to? If *ML Ranger* is in the way of your program, relocate *ML Ranger* to another part of memory. It is extremely fast and efficient. It takes care of all absolute addressing inside the program's parameters. This includes JMP, JSR, LDA, STA, ORA, AND, and other commands. There is, however, one thing that is not picked up. This is indirect addressing of any sort. For example, if you create a raster interrupt, the values would have to be adjusted manually. But this happens perhaps once within a program, if at all.

Addresses are entered in hexadecimal format, with the starting address first and the ending address last.

This program is simple but very useful. You should add it to your software library just in case you run across such a situation. It is an invaluable utility, since you can save many an hour of manually transferring a program. ☐

SEE PROGRAM LISTING ON PAGE 84

128 SMART MERGE

By Shawn K. Smith

As a computer programmer, I find myself using the same routines time and time again. And to avoid retyping the routines over and over, I store them on disk and combine them together as needed. This way I save typing and debugging time.

But combining programs on the Commodore 128 is not as easy as on more expensive computers with commands available for this purpose. There are two methods of combining programs on the 128: appending and merging. But both these methods are deficient in one area: intelligence! With appenders, if the first line of the program being appended is not greater than the last line of the program it's being appended to, the line numbers will be out of sequence and the program won't function correctly. With merges, you don't have that problem; but you do have to worry when one program has line numbers identical to those of the program it's being merged with, in which case the program becomes unrecognizable, unpredictable, and unusable.

Of course, I would not have mentioned this dilemma if *128 Smart Merge* did not eliminate it. *128 Smart Merge* is a short, 256 byte machine language utility in the form of a BASIC loader. The ML is contained within the data statements and is POKEd into RAM when the program is run. (Before running the program for the first time, save a copy to disk.) By default the ML code will be stored in free RAM starting at 5120/$1400, but you are given a chance to enter an alternate starting address. *128 Smart Merge* is relocatable on even-page boundaries. That is, the address you choose must be evenly divisible by 256. You can use decimal or hexadecimal numbers when entering an address. Hex numbers should be preceded by a dollar sign ($). For example, 2816 and $B00 are both acceptable.

Since *128 Smart Merge* is kept separate from BASIC when it's run, you can load and run it before you begin your programming session. And when you are ready to combine a program (module, routine, etc.) with the program in memory, SYS to the starting address of the utility. A filename is requested. The file should be in drive 0, device 8. The line numbers of the file on disk do not matter. *128 Smart Merge* scans the program in memory, determines the last line number, loads the file from disk, renumbers the file using increments of ten from the last line in the original program, and merges the two together. An error such as a GOTO referencing a non-existing line will cause *128 Smart Merge* to abort the merge, leaving your original program untouched.

128 Smart Merge was designed to live peacefully with BASIC and other utilities which may be sharing space in the computer. For instance, two vectors on page three (IMAIN, IERROR) are changed and restored to their original values before *128 Smart Merge* returns complete control back to BASIC. Undesirable results may ensue, however, if the RUN STOP key is pressed while the program being merged is loaded from disk.

I believe *128 Smart Merge* is as intelligent a program combiner as your Commodore 128 system will ever need. Should you think differently, I'm interested in hearing about it. □

SEE PROGRAM LISTING ON PAGE 98

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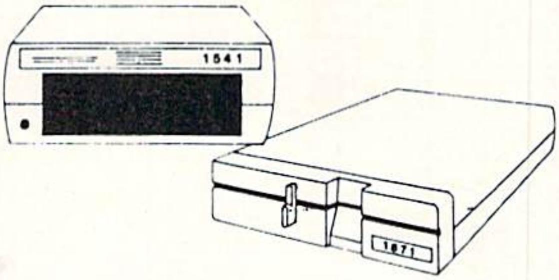
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"...excellent, efficient program that can help you save both money and downtime." Compute!'s Gazette, Dec., 1987



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C-64 EMULATORS FOR THE AMIGA

Text and Photos by Morton Kevelson

The concept of having one computer mimic another has been around almost from the time the first computer was replaced by a more powerful machine. In fact one of the Amiga's original selling points was its ability to mimic the IBM PC. Although *The Transformer's* mimicry was somewhat limited, it has proved adequate for running certain applications.

The emulation of one computer by another can take many forms. Perhaps the most difficult method, and the one which offers the most limited success, is software emulation. This approach attempts to re-create the hardware and software functions of the emulated computer entirely in the software of the host machine. *The Transformer* took this approach.

At the opposite end of the spectrum is hardware emulation. With this approach nearly the entire hardware and firmware of the emulated computer is physically assembled. The host computer does little more than act as an intelligent terminal and display device for what is virtually an independent machine. This is the approach used by the Sidecar for the Amiga 1000 and by the Bridge Card for the Amiga 2000. In general the hardware emulation is so complete as to include a microprocessor, dedicated RAM, an operating system in ROM, and a completely independent I/O section.

We feel it is significant that the Commodore 64 was chosen by developers other than Commodore as the first machine for emulation by the Amiga. It tells us that a significant number of the eight million or so Commodore 64 owners are expected to move up to the Amiga. In fact we have already received not one but two working C-64 emulators, with a third one rumored to be not far behind. We would have liked to report that these C-64 emulators are a resounding success. Unfortunately it is just not so. However, what we have seen is very encouraging. We expect future releases of these products to substantially improve upon their present performance.

Both of these products are software emulators with adapter cables to allow the use of C-64 serial bus peripherals such as the 1541 disk drive, serial port printers, or printer interfaces. The lack of any additional hardware precludes the use of C-64 cartridges, cartridge port peripherals, or user port peripherals such as the 1670 modem.

At first glance the C-64 would appear to be a machine which might be easily emulated on the Amiga. After all, the C-64's microprocessor is a piddling eight bit engine running off a clock which plods along at merely one MHz. By comparison the Amiga sports a 16/32 bit engine chugging along at more than seven times the speed of the C-64. Not unexpectedly, first impressions can be deceiving.

The C-64 also contains some fancy support hardware such as a sophisticated graphics display chip with several text and graphics display modes. Add to this the C-64's full-fledged three voice synthesizer on a chip and a complex memory management scheme, and the Amiga finds its work to be cut out for it.

THE 64 EMULATOR
ReadySoft Inc.
Amiga with 512K
Price: $39.95

The 64 Emulator is provided on a copy protected disk in three possible configurations. It is available as a pure software product, or it may be had with a serial bus adapter cable for the Amiga 1000 or the Amiga 500/2000. The adapter cable is a passive device which connects to the Amiga's parallel port at one end and terminates in a C-64 male serial port connector at the other end. This cable may thus be plugged directly into a 1541 or 1571 disk drive. Serial port printers may be daisy chained off the disk drive in the usual C-64 fashion.

The program disk is inserted at the Workbench prompt, upon which it autoboots and takes complete control of the computer. As a result, multitasking is disabled. For C-64 users, the opening screen will have a familiar look to it. The usual light blue blocky







Top left: options currently available with 64 Emulator. *Bottom left: the* Emulator's *easy-on-the-eyes alternate character set. Above: introductory screen.*
READER SERVICE NO. 125

characters on a dark blue background present the unforgettable two line C-64 message with 38911 bytes free. A third line proclaims this program's true origin. A C-64 reset, such as by an SYS 64738, brings back only the generic C-64 message.

The only really noticeable discrepancy with the C-64's original display is the lack of side borders. The display screen of *The 64 Emulator* is dark blue from edge to edge, while the top and bottom borders still remain. The creators of *The 64 Emulator* felt the lack of side borders was justified in view of the increased operating speed which could be had at their expense. The Amiga's video display hardware makes it difficult, and time consuming, to create a distinctly colored side border.

Although the display looks like a C-64's, a single vestige of the Amiga's multitasking capability remains. The simultaneous depression of the CONTROL and HELP keys immediately brings forth *The 64 Emulator's* Configuration Editor screen. This lets you customize *The 64 Emulator* for the hardware configuration that best suits your needs.

The Configuration Editor supports up to four physical disk drives with a variety of disk formats. To begin with, standard C-64 drives, such as the 1541 configured as device numbers 8 through 11, may be plugged into the serial cable adapter. Within *The 64 Emulator* any logical drive number may be set to any hardware drive number. For example, the C-64's device number 8 may be assigned to a 1541 drive which has been set to a hardware device number 9. This is an interesting concept that may be useful to C-64 users with several disk drives.

On the Amiga side any Amiga disk drive, including hard drives and RAM:, may be selected for use by *The 64 Emulator.* In this case an Amiga drive may be configured to emulate a 1541 or it may be used as a standard Amiga drive. In fact both configurations can exist on a single physical Amiga disk drive.

When emulating a 1541 on an Amiga drive, *The C-64 Emulator* actually creates a single AmigaDOS file with the capacity of a 1541 formatted disk. This file is even organized with the 1541's track and sector configuration, and may be edited with a track and sector editor. The 1541 emulation file supports all standard 1541 file formats including program, sequential, user, and relative files. Once the 1541 emulation file is created we are still left with over 700 kilobytes of space on an 880K Amiga disk. The remaining space may be used in standard Amiga format.

When using standard Amiga format, all files show up on the C-64 directory listing as types PRG or DIR. The DIR type of course represents an AmigaDOS directory. If you wish to access the files in an AmigaDOS directory, the Assign command can be used to assign the directory to a C-64 logical device. To utilize the standard Amiga disk format from *The C-64 Emulator* simply SAVE or LOAD files to it just like any other 1541 disk drive. Of course you will have a much greater capacity than a 1541 disk.

The 1541 emulation file is best used for programs which randomly access sectors on the disk. *The 64 Emulator's* distribution disk is provided with a transfer program which copies an entire 1541 disk into the 1541 emulation file on an AmigaDOS disk. Operation of the transfer program, like all 1541 operations under *The 64 Emulator,* is slow. It took over 20 minutes to copy an entire disk. In general fast loaders will not work under *The 64 Emulator.* As a result we felt as if we had gone back three years in the history of the 1541 drive. We used the whole disk duplicate technique to successfully copy and run an Infocom adventure game. When running an Infocom program under *The 64 Emulator* be sure to answer no to the question regarding the use of a 1541 drive, even if you are using a 1541 disk drive. Incidentally, the 1541 transfer program may be used to copy individual files from a 1541 disk to a standard Amiga disk.

Two printers are supported as C-64 devices 4 and 5. These may be configured to run from the Amiga's serial port or parallel port or from the C-64's serial port. The joystick ports have to be specifically configured for the intended input device due to the differences in the way the Amiga's game ports operate as compared to the C-64. The game port options are joystick, paddles, 1350 mouse, and 1351 mouse. The default game port configuration is for paddles in Port 1. This lets you leave the Amiga's mouse plugged in while running *The 64 Emulator.*

The 64 Emulator requires a minimum of 512K to run. However, if your Amiga has at least one megabyte of RAM, 256 kilobytes may be set aside to emulate the 1764 RAM module as well. The remaining settings in the Configuration Editor are primarily cosmetic. An alternate character set, based on a single pixel format, may be chosen. This results in a very crisp display on a 1080 monitor. Finally the screen borders and color may be turned off entirely. The latter results in a green screen display. Turning off color should also result in a speeding up of the operation of *The 64 Emulator.*

For most applications there will be a noticeable slowing down of the program's operation. According to the manual, some applications will run at full speed while others will slow down from two to five times. We will not dispute these claims.

The Amiga and C-64 keyboards are not identical, which means that some key reassignment was inevitable. Whenever possible *The 64 Emulator* makes use of the corresponding key symbols on both machines. Thus the quotes symbol, which is a SHIFT-2 on the C-64, becomes a SHIFT-[APOSTROPHE] on the Amiga. The up arrow, which has its own key on the C-64, is assigned to the caret, which is the SHIFT-6 on the Amiga. The cursor keys are individually assigned on the Amiga. In fact the SHIFT key has no effect on the cursor key assignments. The following table shows the remaining keyboard assignments between the C-64 and the Amiga 1000:

C-64	Amiga
RUN STOP	ESC
RESTORE	DEL
CONTROL	TAB
COMMODORE	Left Amiga
CLR/HOME	F10
INST/DEL	BACK SPACE

In addition, the combination of the CONTROL, Left ALT and HELP keys should reset *The 64 Emulator* to C-64 BASIC when all else fails.

We are sure that the real question on everyone's mind is just how well *The 64 Emulator* works with commercial software. We hate to disappoint you, but it just was not possible to try out every program in our library in time

for this review. In fact, at the standard loading speeds of the 1541 disk drive which we must use with *The C-64 Emulator*, we would probably spend many weeks just booting each program once. We did have the opportunity to take a random sampling and present the results forthwith.

The 64 Emulator's package claims that it will work with *Paper Clip.* We were unable to verify this with two different versions of *Paper Clip*, possibly due to a problem in configuring the joystick port to work with *Paper Clip's* security key. However, we did see *Paper Clip* running at AmiEXPO. We must assume that this was the unprotected release of the program. We were able to run *GEOS* version 1.2; however, the program's response was so sluggish as to be practically unusable. On the other hand we were able to get satisfactory results running *Easy Script* and *Super Script*, but had no luck with *Paperback Writer.*

Micromon, the popular public domain machine language monitor, worked without a hitch. We were able to examine the copies of the C-64's BASIC and Kernal ROMs which *The 64 Emulator* incorporates as part of its program code. We were even able to bank out the BASIC ROM and access the underlying RAM by changing the contents of the 6510 microprocessor's I/O register at location 1.

For the pure joy of it we ran the *Swinth* sample demo program, which exercises both the bit map graphics and sound facilities of the C-64. The program ran a bit slow but was otherwise its usual impressive self. We gave *The Music Studio* a shot with no success and QuantumLink version 4.0 balked on the disk load. On the other hand both the high resolution and multicolor bit map graphic programs of *The Advanced OCP Art Studio* worked a bit slow but otherwise just fine. We next went after some Electronic Arts material in the form of *The Bard's Tale*, which failed to perform. We thought that *Realm of Impossibility* was going to make it after a ten minute load, but it locked up part way through the opening screen.

At this point we thought we detected a hint of smoke from our 1541 disk drive and decided to call it quits. Overall we feel that all C-64 BASIC 2.0 programs should work with *The 64 Emulator.* Machine language programs, which do not rely too much on raster interrupts, should function properly. We did notice some evidence of problems with C-64 sprites. For commercial programs we feel that unprotected software as well as standard DOS protection should work. The advanced DOS protection used by some programs, as well as fast loaders, are apt to cause trouble.

The 64 Emulator does incorporate some intelligence in its loading routines. The ability to recognize, load, and run certain packages, such as *GEOS*, has been included. The custom loader approach seems to be the only way to handle the wide variety of protection and loading schemes which exist for the C-64. We expect that ReadySoft will add more custom routines to future releases of the program.

ReadySoft Inc., P.O. Box 1222, Lewiston, NY 17092 (phone: 416-731-4175). In Canada: 3520 McNicoll Avenue, Unit 2-238, Scarborough, ONT M1V 2T0. *–Morton Kevelson*

GO 64!
Software Insight Systems
Amiga with 512K
Price: $69.95

We examined three versions of *GO 64!* in as many weeks before starting this review. We first looked at a prerelease version, followed by a distribution copy which we obtained at AmiEXPO, and finally a prerelease copy of the first upgrade. Our initial reaction was to hold off reviewing *GO 64!*, as many of its features were not yet implemented. We decided to go ahead with the review after lengthy discussions with the manufacturer regarding their plans for *GO 64!*

If you have come to the Amiga from the Commodore 128, the source of the *GO 64!* monicker will be obvious. It derives from the command used by the C-128 to switch over to C-64 mode. Under the circumstances, we do not think Commodore will object to SIS's use of the look and feel of this command for the title of this product.

The *GO 64!* package consists of a copy protected disk and the *GO 64!* interface. It is the latter component which allows the use of Commodore 64 serial port peripherals, in particular the 1541 disk drive, with the Amiga. The *GO 64!* interface is essential to the operation of the accompanying software. As such it acts as a security key for additional copy protection. We were unable to examine the internals of the *GO 64!* interface, as they were encased in epoxy. However, an SIS spokesman indicated that the *GO 64!* interface did contain pull-up resistors on the serial port lines to the five volt supply. The presence of the pull-up resistors should allow the use of serial port peripherals, such as printer interfaces, without the use of a 1541 disk drive in the chain.

The *GO 64!* intérface, which plugs directly into the parallel port, is configured for the Amiga 500 or the Amiga 2000. An adapter cable is required to use the *GO 64!* interface with the Amiga 1000. The output of the *GO 64!* interface is to a standard C-64 serial port connector, for which the user must supply the serial port cable.

The program may be booted from its own copy of Workbench or from the user's copy. Simply click upon the *GO 64!* icon and it takes complete control of the Amiga. Once in *GO 64!*, the only way out is to reboot the machine. Before starting you have the option to set some of its operational parameters via the *GO 64!* Preferences. Some of these settings are purely cosmetic, such as the choice of default colors for the screen, border, and text. Incidentally, *GO 64!* does display the complete border of the C-64's screen. Most of the settings are critical to *GO 64!'s* performance and as such are deserving of a detailed description.

Perhaps the most noteworthy setting is the selection of the Hyper-Code file. Hyper-Code is SIS's trademark for their custom crafted parameter files. Due to the wide variety of protection schemes, in particular the number of fast load methods currently employed by C-64 software packages, it is impractical to develop an emulation which can accommodate them all. To get around this, SIS will be continuously developing Hyper-Code files to accommodate a variety of C-64 software titles. The new Hyper-Code files, as well as generic program improvements, will be released as a regular series of upgrades. According to an SIS spokesperson, upgrades will be distributed free to all registered users with no time restraints. Simply send in the original program disk and receive an upgrade

by return mail. This seems to supersede the upgrade policy as stated in the manual, which requires a $15 upgrade fee after 30 days.

As of this writing there was a single Hyper-Code file on the distribution disk for GEOS V1.2. This did enable *GO 64!* to load and run GEOS; however, the program's response to user input was so sluggish as to be virtually unusable. We suspect that the true purpose of the GEOS support was simply to prove that *GO 64!* could do it.

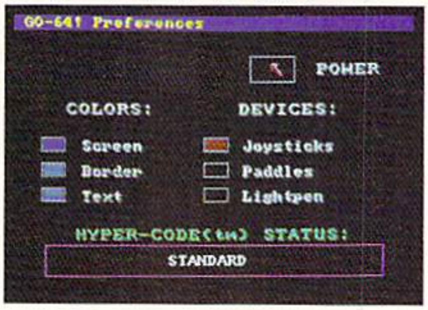
The current version of *GO 64!* works best with software which uses the C-64's raster interrupts for timing. The C-64's VIC chip may be set to generate an interrupt which corresponds to any position of the video beam on the display. The alternative timing method, which uses the CIA timers, is not fully implemented in the current version of *GO 64!* To optimize the speed at which a particular program may run, *GO 64!* lets you set the raster rate at which interrupts occur to 15, 30, or 60 times per second. For programs which do not use raster interrupts, they may be turned off entirely. For example, with GEOS we found a rate of 30 times per second seemed to work best.

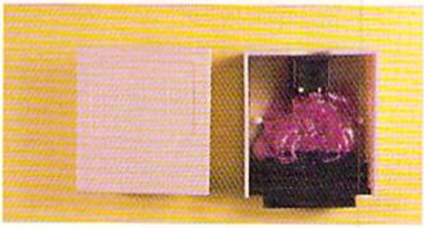
Many of the options on the *GO 64!* Preferences screen are not yet implemented. As of this time *GO 64!* does not emulate the C-64's sound capabilities (the SID chip). Only a single 1541 disk drive is currently supported, although the menus show options for up to four drives including the 1541, the Amiga 1010, and the Amiga 1020. Some confusion may result, as the unimplemented functions are not ghosted on the menus. A notepad file on the distribution disk provides the current status of *GO 64!'s* options.

The supported C-64 game port devices are the joystick, paddles, and light pen, with the default being the joystick. All devices may be active at the same time; however, emulating unused input devices will needlessly slow down the operation of the program.

The current version of *GO 64!* requires that the Preference settings be saved to disk before they take effect. Since the settings include the current Hyper-Code file selection, this could mean a resave of the Preferences every time you boot up. At best we feel this is a risky procedure for a copy protected disk. Future versions of *GO 64!*







Top left: introductory screen from* GO 64! *Top right:* GO 64! *Preferences screen for customizing the system. Bottom right: cartridge internals have been smothered in epoxy for durability and immunity from prying eyes.
READER SERVICE NO. 129

will permit direct implementation of the Preferences settings without first saving them to disk.

Once *GO 64!* is started there is no way to change the Preferences without rebooting the system. This made it awkward to fully test the program for this review. A typical test required us to reboot the Amiga, change Preferences, save Preferences, restart *GO 64!*, load the C-64 program, and observe the effect if any. To try another setting we had to reboot via a CONTROL-AMIGA-AMIGA. The *GO 64!* manual mentioned the LEFT ALT-AMIGA-AMIGA key combination as a way to reset the C-64 emulation; however, this feature was not yet implemented.

Except for the opening message, the C-64 display looks just like the real thing. In deference to copyright concerns, *GO 64!* does not provide a copy of the C-64's BASIC and Kernal ROMs on the distribution disk. Instead a pair of pseudo ROM files are included on the *GO 64!* program disk. If you wish, these may be renamed and replaced by actual copies of the C-64's ROMs. The Notepad file contains a brief BASIC program for copying your C-64's ROMs to disk. You then have to transfer the files to the Amiga via modem or some other means. After the ROM files are installed on the *GO 64!* disk, the C-64 display is exactly like the original, with a slight improvement in terms of compatibility.

The *GO 64!* keyboard assignment has been kept as close to the C-64's as possible. For example, the quotes are the SHIFT-2 key combination just like on the C-64. This resulted in endless confusion with keys which were on both the C-64 and the Amiga but in different locations. Keyboard input seemed to be a bit sluggish at times. The most disconcerting thing was the tendency of text to appear in groups or clumps on the video display, lagging behind the actual input on the keyboard. An SIS spokesperson indicated that the cause of these apparent anomalies was *GO 64!'s* perfect emulation of the C-64's direct keyboard scan for maximum compatibility with programs that use this capability. A future release may include the ability to turn off this option, as well as the screen's borders, to speed up the operation of programs which do not need this capability.

As before we did a cursory run through of several C-64 programs. In general all programs ran slower than on an original C-64. According to SIS the best performance they expect from most C-64 software is on the order of 70 to 85 percent of actual speed. In fact some programs ran so slow that we were able to observe the updating of the bit map display.

With regard to the actual program tests, we were unable to get *Micromon* to work; however, Jim Butterfield's *Supermon* and *Supermon +* seemed to work just fine. The latter even let us bank out the BASIC ROMs and observe the underlying RAM. We got *Easy Script* to run but failed with *Superscript*. Infocom games worked just fine as long as we did not accept the 1541 disk drive option. The public domain *Disk Doctor* program looked good, while *Jumpman* would not get started. We got the *Advanced OCP Art*

Studio programs up and running but were unable to access the 1541 disk drive once we were into the program. Our *Art Gallery* slide show programs worked nicely. Specifically, *GO 64!* did not exhibit any problems with C-64 sprite emulation. Sprites are done via software in the bit map. According to SIS, up to 64 pseudo sprites may be on the screen at one time.

Software Insight Systems, Inc., 16E International Drive, East Granby, CT 06026 (phone: 203-653-4589).

—Morton Kevelson

Conclusions

While the temptation is strong to indicate one of these products the winner we are not going to do so. We feel that both these products have a way to go. The *64 Emulator* clearly has more implemented features at this time; however, we were not impressed with the overall compatibility of either program with the vast library of existing C-64 software. We strongly feel that it will be the long term support of these products by their manufacturers which will determine their success. In fact we predict that what you will actually get about three months from now will bear only a passing resemblance to the products we looked at for these reviews.

FACC, A FLOPPY ACCELERATOR

ASDG Incorporated
Amiga with 512K
Disk; $34.95

There's very little that we can accomplish with our computers that cannot be done without them. Games might be less fun, writing more tedious, and number-crunching a downright pain; but we could still do all those things. Computers open new vistas, but mainly, they make things easier and faster.

Choosing between two otherwise identical computers, most people would choose the faster one. Now you have that choice, without learning a new operating system, without reinstalling all your software, and without spending a lot of money.

Facc, A Floppy Accelerator from ASDG won't turn your Amiga into a screamer, but it will speed up the most common bottleneck—disk access. For all the speed and power of the 68000 CPU, it can only work with new data as fast as it can be loaded from a disk (or typed at the keyboard).

Facc allows you to create a disk cache, which is simply a chunk of RAM that is set aside to store data that would otherwise be found on a diskette. A disk cache starts off empty. Whenever the computer asks the disk drive to send over some information, it is stored in the cache *and* sent to the program that requested it. If the program later asks the drive for the same information, the request is stopped by the cache. The cache knows it holds the requested information, so it zips that info back to the program at RAM speed, without the drive ever knowing anything happened.

The electronic signals from the cache can respond much faster than the physical disk drive. This holds true even for hard disks; a cache can almost always speed things up.

Based on this description, you can see that a disk cache will not speed up all floppy operations. The physical disk drive does not actually read or write data any faster. It's just that certain (duplicate) "read" requests do not have to be handled by the drive at all.

So, copying 100 files from one disk to another won't be affected by a cache. Neither will formatting blank diskettes. Most games will not benefit either (unless you waffle back and forth between two screens that are each loaded from

the disk). And since a cache is just another software program, you must load it, then load your application. Some games won't allow this.

Where you will benefit from a cache is in using applications software that moves data to and from the disk. A spreadsheet that is limited to available memory does not fall in this category. It loads a data file, lets you edit it in RAM, then saves it. Word processors, databases, and accounting programs are more likely candidates to benefit from disk caching.

If you use applications like these that regularly write to and from the disk while you're working on your data, you *need* a disk cache. You may remember that the ADDBUFFERS in the Startup-Sequence file command creates a small cache whenever you boot up. But it doesn't remind you how big a cache it has created or give you an easy way to change the size of that cache.

Instead, use *Facc*. Just like the Amiga's RAM disk, *Facc* is dynamic. You can increase or decrease its size while you are running a program. *Facc* will also show you its size and how effective it has been at reducing access to the physical disk drive.

Whether you run *Facc* by clicking on its icon or from the CLI, it opens a window that shows the RAM left for your programs, the number of buffers (about ½K each), and data on the cache. To increase or decrease the size of the cache (the number of buffers), you would click on the "More" or "Fewer" buttons.

To get an indication how much time the cache is saving you, read the data in the center of the *Facc* window. It shows the number of read and write requests made by the program, the number of read requests stopped by the cache, and the number of buffers used by each disk drive. It also shows the percentage of total read requests served from the buffer (the higher this percentage, the more the buffer is speeding things up).

With *Facc*, it is easy to increase the size of the cache so it will do the most good with your program. If the next application you run needs more memory, just decrease the size of the cache. With ADDBUFFERS, I had always limited myself to 50 buffers, or about 25K, so I wouldn't use up too much RAM. With *Facc*, I commonly use 200 or more buffers—whatever RAM the application does not need.

You can get a good example of the effect of a cache by just listing the directory of your WorkBench disk (with its 160+ files) twice in a row. The first time, the directory must be read from the disk; the second time, it can be read from the cache.

By typing "DIR DF0: OPT A" you'll get a listing of all the files in all the subdirectories. With no cache, this will take 30 seconds. With a small cache (50 buffers) it will still take 30 seconds. But with a big cache (256 buffers), the screen directory listing will be much faster. Using *Facc*, the directory will list in only 8 seconds. With ADDBUFFERS, it will take 15.

Facc has another leg up on ADDBUFFERS too. *Facc* will always use Fast memory if it is available; ADDBUFFERS will use Chip memory, the first 512K bytes of RAM in your Amiga. Fast memory is everything above that. You want to preserve Chip memory when possible because the special Amiga hardware chips cannot address RAM above 512K.

Is *Facc* safe? After all, it's storing your data in volatile RAM. Yes, because *Facc* only buffers disk reads. Disk writes are immediately passed through to the floppy, where your data is safe and snug.

Facc protects you when you change diskettes. It senses the change and immediately clears all buffers assigned to that drive so you don't "read" data from the old diskette. If you decide you do not want a cache, just click *Facc's* close gadget and it will wipe itself out, freeing up all the memory it had used. To stay out of your way while you are using an application, *Facc* can be hidden behind the application or shrunk to a two-line window on top.

Could *Facc* be improved? I see four ways. First, although *Facc* can cache four floppies, it will not allow you to assign a certain number of buffers to each drive—it dynamically allocates *all* the buffers. I would prefer to be able to allocate a minimum number of buffers to certain drives.

Second, *Facc's* data display is in four columns, one for each drive. The first column will correspond to the first drive accessed after *Facc* is loaded, not necessarily to DF0:. This could get confusing. I find myself loading *Facc* from DF0:, then immediately accessing DFl: to keep them in the "right" order on *Facc's* display.

Third, I would love for *Facc* to know how many buffers I want to use with certain applications. It could default to the current 256 (about 128K) but then "remember" that with my favorite word processor, I only use 150 buffers and decrease its size accordingly. I'd have to figure out how many buffers the first time, but after that, why should I have to tell *Facc* every time?

Fourth, *Facc* provides no way to reset its data display to all zeros. When testing *Facc* with a new application, I'd like to start with a fresh display. To do so, I have to exit from *Facc*, then restart it.

The *Facc* disk also includes four bonus programs—*FastMem, SysMon, DropCloth*, and *RunBack*. *FastMem* will allow some older Amiga programs to run on upgraded machines by "removing" all Fast memory while the program loads. *SysMon* shows how your Amiga is performing, including I/O interrupts per second (keyboard and disk), number of tasks loaded, number of tasks waiting, percent of CPU time actually *doing* something, free Chip memory, etc. *DropCloth* creates a blue and white 8X8 dither mask for your WorkBench surface. You choose one of 64 different patterns, several of which make a pleasing and distinctive background. *RunBack* lets you start certain programs (like *Facc* or *DropCloth*) from a CLI window and exit that CLI while the program is still running.

Facc is a quality utility from a company that has supported the Amiga well. ASDG has released shareware and hardware products and its president has published tutorials to help us all understand our computers better.

Using *Facc* will provide Amiga users with a considerably faster disk system overall, as well as a product that is both convenient and reliable.

ASDG Incorporated, 280 River Road—Suite 54A, Piscataway, NJ 08854 (phone: 201-540-9670).

—Richard Herring

MARAUDER

For the C-64

By Cleveland M. Blakemore

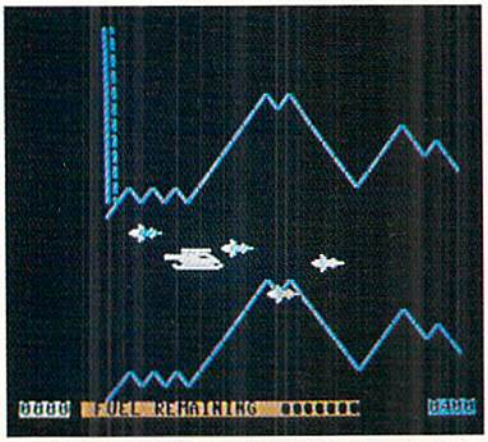


PHOTO: MICHAEL R. DAVILA

The chopper lifts off the pad in a flurry of dust as the lethal rockets race overhead into the mouth of the cave tunnel. You leave the airfield without even a clearance from ground control.

The enemy has fired a barrage of highly sophisticated cruise missiles into the cavern where your secret headquarters is located. Your turbo-driven helicopter, code name *Marauder,* is the only aerial vehicle in the world that can fly through the narrow labyrinth and destroy the missiles before they wipe out the base.

Marauder is a fast, nonstop action arcade game for the C-64 in machine language. Plug a joystick into Port 2.

After the theme music plays, choose a tunnel (1-4) using the function keys. The first tunnel is the easiest, with subsequent tunnels being narrower, longer, and containing a greater number of rockets between you and the base.

Fire your heatseekers with the joystick button. Your range is limited to the first ¾ of the screen, so wait until the rockets are in range before firing a missile.

The only way to keep your fuel indicator bar up is to continue to hit rockets, so don't stop firing for long! Each missile hit will boost your fuel bar up a few notches. If you run out of fuel, your chopper will sink to the floor of the cavern in flames.

The cavern is very hard to negotiate, especially at the beginning. Pull all the way to the left of the screen to get the fullest amount of time to anticipate twists and turns. Most difficult is the opening of the cavern, which missiles may be entering at the same time you are!

If you wipe out a whole battery of rockets (6), you will have saved the base. After Tunnel 1, you will need to wipe out more than one barrage to win. The tunnel gets narrower with each new barrage. At Tunnel 4, only the most talented pilots will be able to worm through the cave without splashing the chopper against the walls.

A high score is maintained at right, with the current score at lower left. Faster moving rockets are worth more points. A bonus is awarded for reaching the base safely.

The game is completely in machine language, so you'll need to enter it using *Flankspeed* (see page 81). SYS 49152 to start. Now get going, those rockets just flew by overhead! ☐ *SEE PROGRAM LISTING ON PAGE 93*

RUPERT REPORT

Continued from page 40

This chart puts in one place all of the commands, their parameters, the ranges of the parameters, and notes indicating which commands are affected by others.

The parameters which are underlined in the command line are mandatory and must be specified each time the command is used. The others are optional and retain their previous or default values until they are explicitly changed.

The parameters are "place sensitive." This means, for example, that Step Size in the SOUND command must always be in the same place in the parameter list, namely sixth. If you don't want to change parameters 4 or 5, you don't have to specify them, but you must still identify their places in the list. Since the parameters are normally separated by commas, just use adjacent commas to signify unchanged parameters. The statement

```
SOUND 1,1640,60,,,200
```

gives voice 1 a frequency of 100 Hz (1640/16.4) and a duration of 1 second (60/60). It does not change the previous or default values of step direction, minimum frequency, waveform, or pulse width. It sets the step size of the frequency sweep to 12 Hz (200/16.4). Notice that commas do not have to be added for unspecified parameters at the end of the list.

We need another month or two to discuss all of these sound commands in detail. Here are some generalities that may clear up some of the confusion.

PLAY v. SOUND: The two primary audio commands are SOUND and PLAY. SOUND is most useful for sound effects. PLAY is most useful for producing tunes. The frequency sweeping parameters of the SOUND command cannot be duplicated with the PLAY command. On the other hand, the sound quality capabilities provided by the ENVELOPE command affect only the sounds produced by the PLAY command. The PLAY command allows individual, named notes to be played with well-defined rhythms and tempos. SOUND is more of a free-form sound generator.

ENVELOPE v. FILTER: These are fundamentally different commands. ENVELOPE affects the *amplitudes* of individually played notes as well as specifying a particular waveform. Since the SOUND command does not deal readily with individual notes, ENVELOPE is not appropriate for it and does not affect it. FILTER limits the *frequency content* of every sound produced by any voice with either SOUND or PLAY whenever it is enabled for that voice. It may affect any or all of the voices, but only one set of filter parameters are in effect at any one time. FILTER reduces the number of harmonics in a waveform. ENVELOPE, by dynamically altering the amplitudes of individual notes, increases the harmonic content of the waveform. There are ten predefined ENVELOPES, although any parts of any of them may be changed as desired. The PLAY "T" command tells which envelope is to be used. ENVELOPE 0 is a piano by default, but it could be changed to a zither if you prefer.

VOL and TEMPO: These simple commands affect the volume and rhythmic speed of notes produced by PLAY. The PLAY "U" command can override the VOL command. Since SOUND does not deal with individual notes, TEMPO is not relevant and does not affect it. VOL is used for setting the volume of the SOUND output, although the PLAY "U" command will change the volume of SOUND outputs as well.

These charts and generalizations are not necessarily complete. There are many fine points yet to be covered. I recommend that you read the two sections in the *C-128 Programmer's Reference Guide* (starting on pages 336 and 599) for very informative discussions of the commands and the electronics as well as the nature of sound.

We can't do justice to the ENVELOPE and FILTER commands this month. You might enjoy running the program *ENVELOPE and FILTER Sampler* to get a taste of their capabilities. Hopefully that will encourage you to investigate these commands yourself.

I strongly urge you to connect your computer to an external amplifier and loudspeaker. It is very easy to do, and the difference in sounds you hear can be truly incredible. Use a 5 or 6 pin circular DIN plug (Radio Shack numbers RS 274-003 or 274-020). Connect a pair of wires (preferably the shield and inner wire of coaxial cable terminated with a phono plug such as RS 42-2371) to pins 2 (ground) and 3 (audio out) respectively of the connector.

Plug the phono plug into the AUX input of an audio amplifier connected to a decent speaker, and hear some truly impressive sounds. Even a small external amplifier (Radio Shack and others sell them for under $15) and speaker will make a noticeable improvement. The better the speaker you use, the better the sounds will be.

We have covered most of the basics. There are many exotic topics left to discuss. ENVELOPE and FILTER are some heavy duty commands with which to experiment. Analyzing the frequency components of complex sounds (Fourier analysis) is an interesting challenge. Constructing complex waveforms from simpler ones (Fourier synthesis) is also enlightening. Ring modulation, beats, synchronization, and assembly language interfacing are other topics which we will investigate in future issues.

There is a world of physics to explore in the sound generator of your Commodore computer. If you get tired of the physics, you can always sit back and let it play you a tune. ☐

SEE PROGRAM LISTINGS ON PAGE 82



DARK FORTRESS II

Included on the February *Ahoy! Disk* is *Dark Fortress II*, sequel to Cleve Blakemore's popular text adventure for the C-128. The game supports two different players on separate monitors in 128 mode.

See page 77 for information on ordering this month's *Ahoy! Disk*. If you'd like a master map for *Dark Fortress II*, along with hints for completing the adventure, send a SASE with $1.00 to Cleve Blakemore, c/o *Ahoy!* Magazine, 45 West 34th Street—Suite 500, New York, NY 10001.

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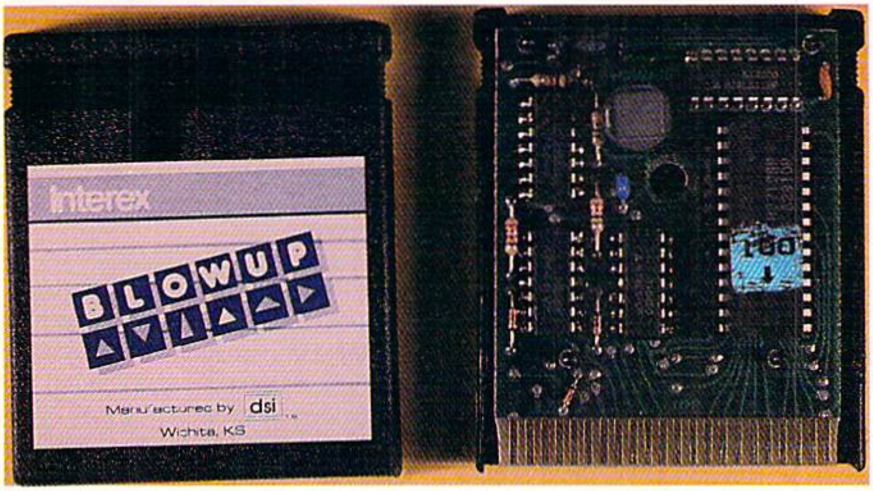
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DEALERS—WE HAVE THE SUPPORT YOU'RE LOOKING FOR!

We now forge ahead in our coverage of the C-64's expansion port (see December and January *Ahoy!'s*) by presenting two unique products to be applied thereon. For those of you who feel we're getting into a digital rut, rest assured that we are not neglecting the computer's other aspects. We simply felt that the subject was so broad that it deserved this detailed attention. Even so we have barely scratched the surface, leaving many worthwhile products untouched. For example, Commodore's own memory expansion devices (the 1750 and the 1764) may be the most significant expansion port accessories for the C-128 and the C-64.



Top: **Blowup** *comes stocked with 16K of ROM. Right: press* **Blowup's** *push button and you'll see what's shown (except for default to the 1525).*
READER SERVICE NO. 113



PHOTOS: MORTON KEVELSON

BLOWUP
Data Share, Inc.
Commodore 64
Cartridge; $59.95

Blow up: to explode, to inflate, to erupt in anger, to enlarge, to be a cartridge for your C-64. *Blowup*, the subject of this review, is aptly described by the last two definitions. It is a cartridge for the C-64 and it does have the ability to enlarge what is on the screen onto your printer. As a C-64 cartridge, *Blowup* is a close cousin to the memory dumpers we reported on in the November 1987 issue. It remains invisible to the computer until its button is pushed, at which time it takes complete control of the machine and displays its menu.

As a memory dumper *Blowup* is highly specialized. It reacts to only a small portion of the contents of the C-64's memory, that part which is responsible for what was displayed on the screen at the moment the button was pushed. Once in control, *Blowup* gives you the option to send the screen to the printer or the disk drive. It recognizes all of the C-64's display modes including text, graphics, and sprites. Its menu tells you exactly what sort of display type you are dealing with and where in memory it is located.

All of *Blowup's* functions are controlled from its menu screen. Simply move to the option you wish to change and use the cursor keys to set the option. Some choices, such as disk saves, present a separate input line. There is no way to permanently set any of the options. The default settings appear every time its button is pushed. This means that if you are doing a series of dumps from a variety of screens you have to go back and reselect all the parameters such as printer type, magnification, orientation, and so on. On the positive side, *Blowup* returns to its menu screen after a screen dump, allowing you to modify any of the parameters and try again.

As a screen dump utility we found *Blowup* to be full-featured and flexible. The supported print styles are a gray scale representation of the screen or a direct black and white representation of the bit map. The dot patterns used for the gray scale are fixed and not subject to modification by the user. The horizontal and vertical magnifications range from 1 to 99 and are independently set. Of course there is no printer which supports so large a range of magnification for a full size screen dump. The extreme magnifications are for use with *Blowup's* crop feature. Any part of the screen, even an area as small as a single pixel, can be printed.

Printer selection includes the ubiquitous Commodore 1525 and its workalike the Okimate 10, Seikosha, Okidata, and of course Epson. Depending on printer type, a variety of dot densities are supported. The Epson is the most flexible in this respect, with six unique print densities. These include the Epson's single density (60 dots per inch), double density (120 dots per inch), and quad density (240 dots per inch). Printouts can be flipped, rotated in 90 degree increments, left or right justified, centered, or indented by a user-specified number of dots.

Screens can also be saved to or loaded from disk. For text screens only the screen codes are saved. For bit map graphics the options depend on the type of display. The fundamental graphics save consists of only the bit map. High resolution screens can also be saved in *DOODLE!* format. Multicolor screens can be saved in Koala format. Saved files can be loaded back into the computer for subsequent printout. To view the file you simply go into the crop picture mode.

File naming with *Blowup* was a bit quirky, mostly due to the explanation in the manual. A maximum of 15 characters is allowed, which can create a small problem with *DOODLE!* files for which the manual tells you to type a

single leading "D". All *DOODLE!* files start with two "D"s. We had to resort to wild card characters to load in *DOODLE!* files with 16 character file names. The manual also neglects to inform you that Koala files must be exactly 15 characters long, with trailing spaces used to make up any shortage. To make up for these minor eccentricities, *Blowup* includes an option which displays the disk directory.

Once you have finished working with *Blowup* you have two ways to exit back to the computer. The first is a cold start, which apparently clears RAM and resets the machine. The second is a warm start, which is supposed to return control to the program at the point at which it was interrupted. We found the latter feature to be unpredictable. For programs which worked well with *Blowup* we were able to exit gracefully most of the time. Occasionally the computer would go off to never-never land.

The inability to always return control to the initiating program was not unexpected, as *Blowup* contains no onboard RAM in which to preserve key parts of the computer's memory. The interactive nature of *Blowup's* operation, as well as the calculation-intensive process of most of the screen dumps, requires that *Blowup* utilize some of the computer's RAM. The possibility of memory conflicts with commercial software will always exist. *Blowup's* own operating system is contained in 16 kilobytes of onboard ROM.



Conclusion

We found *Blowup* to offer a wide range of screen dump options, especially to owners of Epson-compatible printers. In particular, we emphasize *Blowup's* crop feature, size control, and printer density control. The lack of onboard RAM of course limits *Blowup's* ability to return control to the running program.

Data Share, Inc., 717 South Emporia, Wichita, KS 67211 (phone: 316-264-6118). *—Morton Kevelson*

64K QUICK BROWN BOX

Brown Boxes, Inc.
Commodore 64/128
Price: $129

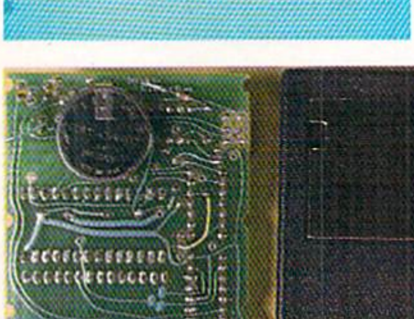
The 64K *Quick Brown Box* is the latest in the relatively new product line from Brown Boxes, Inc. The original, 8K *Quick Brown Box* was shortly followed by a 16K version known as the *Double Quick Brown Box*. We were first introduced to the *Quick Brown Boxes* and their creator, S. Brown Pulliam, at last summer's MARCA convention. Since that time Mr. Pulliam has increased the capacity of his *Quick Brown Boxes* to 32K and finally to the 64K version which is the subject of our review. The way things are going, we wouldn't be surprised to see even bigger *Quick Brown Boxes* before too long. The little critters have a way of growing on you.

In the interest of clarity we will refer to the 64K *Quick Brown Box* simply as the *Quick Brown Box*. The generic class of *Quick Brown Boxes*, which encompasses all memory capacities, will be referred to in the plural.

Interestingly enough, *Quick Brown Boxes* are not brown. The cartridge can be described as a box, but its finish is the usual crinkly black. The monicker is the signature of the designer.

If you haven't figured it out by now, the *Quick Brown Box* is a cartridge for the C-64 and the C-128 which contains 64 kilobytes of memory. In particular, all the *Quick Brown Boxes* contain static RAM in which the continuity of memory is assured by the presence of a 3 volt lithium battery.

The combination of RAM and battery effectively combines the long term permanence of ROM with the ease of revision provided by RAM. As if to emphasize this point, the *Quick Brown Boxes* are provided with all their application and supplementary utility software in the cartridge itself. The first task for the end user is to save the contents of the box to disk. This activity





Right: programs supplied with early release of* Quick Brown Box. *Below: boards from 16K* QBB, *with battery (left); and from 64K* QBB *(right).
READER SERVICE NO. 114

serves the dual purpose of emptying out and freeing the *Quick Brown Box* for other applications and introducing the operation of the box to the user.

What *Quick Brown Boxes* Are Made Of

Externally the *Quick Brown Box* looks like any other ROM cartridge with the exception of a couple of switches. In the upper left hand corner is a miniature slide switch which selects between C-64 and C-128 mode. To the right is a miniaature push button which serves as a reset switch. Of course, on the C-128 the computer's own reset switch may be used as well.

Inside the box resides the specified quantity of CMOS RAM, some support circuitry, and a 160 milliamperehour, 3 volt lithium battery which can maintain the contents of the RAM in a standby state for a period of seven to ten years. As we all know, this is a virtual triple lifetime in the microcomputer world. The long battery life should spare most of you the hassle of ever changing the battery, which is soldered in place.

In C-64 mode the *Quick Brown Box* appears to the operating system like any other 8K ROM cartridge which lives in the $8000 to $9FFF bank. For machine language, the 64K of RAM can be banked in 16K increments into the $8000 to $BFFF range by swapping out the BASIC ROM. The hardware configuration of all the *Quick Brown Boxes* is controlled by a write-only 8 bit latch at $DE00 (56832), which appears in the computer's I/O block. This address was chosen so as not to conflict with the control register of Commodore's own expansion RAM, with which the *Quick Brown Boxes* are compatible.

In C-128 mode the *Quick Brown Box* appears in the memory configuration known as Bank 13. In either C-64 or C-128 mode the functions of the *Quick Brown Box* are available on reset or power up. The C-64/C-128 selector switch may also be used to disable the *Quick Brown Box* in C-64 mode.

What *Quick Brown Boxes* Can Do

When powered up in C-64 mode, the *Quick Brown Box* takes over the computer just like any other autostart ROM cartridge. A menu of the program in the box is displayed and the control is turned over to BASIC with two significant changes. 8 kilobytes of RAM is no longer available to BASIC, as the $8000 block is taken over by the cartridge. In exchange 64 kilobytes, with management for up to 30 programs, becomes instantly available to the user. Access to the programs is via a wedge into the C-64's error routine. This adds the asterisk (*) to the computer's command repertoire. Simply type the asterisk followed by a program's one- or two-character ID code and it will be instantly transferred to the computer's RAM.

The first time you use the 64K *Quick Brown Box,* you verify its contents via the provided checksum program. The resulting number should match what is written on the box. You then proceed to use the provided loader utility to save the entire contents of the box to disk. The box's contents are then saved a second time in single file format, after which the provided programs may be removed from the box to make room for your own routines.

Programs may be individually placed in the box, or an entire block of programs may be booted up at once. The latter operation is facilitated by a fast loader utility. The ability to rapidly boot up entire program blocks makes it possible to maintain files of related utilities. If you order the optional utility disk you will receive several collections of utilities organized in bootable blocks.

We examined the 16K and 64K versions of the *Quick Brown Box.* As of this writing, the software for the 64K version was still in the preliminary stages. One of the available options which has been added to the 64K box is the RAM DOS. This lets you save programs from the computer's RAM to the box without the use of the loader program. The original method of stocking the *Quick Brown Box* with a loader program required that the file to be transferred to the box be loaded from the disk. The RAM DOS supports the bidirectional transfer of both BASIC and ML programs. Existing programs can be easily deleted to make room for new programs.

The advantages of the RAM DOS are readily apparent. The speed of the RAM DOS transfers makes it possible to conveniently back up the program under development at frequent intervals. Once in nonvolatile, battery-backed RAM, the security of your program is no longer subject to the whims of your computer's power supply. The supplementary loader utility also makes it convenient to back up the contents of the box to disk as well. This makes the *Quick Brown Box* the closest thing we've seen to an automatic save on power down for the C-64. Many users will be thankful for this capability.

The earlier release of the *Double Quick Brown Box* included a C-128 utility which provided for a single keystroke transfer of a BASIC program into the *Quick Brown Box.* This utility was omitted from the 64K *Quick Brown Box.* We suspect that it will be reinstated due to popular demand. Those who will be using the *Quick Brown Box* in both C-64 mode and C-128 mode should note that the box has to be configured differently for each mode of operation. This can be easily done by loading the appropriate set of routines at the start of the session. The *Quick Brown Box* can then be restarted by pressing the reset button. The C-

128's autoboot from disk on power up is effectively disabled by the presence of the *Quick Brown Box* in C-128 mode. When in C-64 mode we found that a quick tap of the RESTORE key served to redisplay the *Quick Brown Box's* menu of stored programs.

As a final exercise we searched for a method to disable the *Quick Brown Box* without physically removing it from the expansion port. The following procedure did the trick:

1. Reset the C-64's error vector with

```
POKE 768,139: POKE 769,227
```

2. Disable the *Quick Brown Box* with

```
POKE 56832,128
```

3. Flick the *Quick Brown Box's* selector switch to C-128 mode. We didn't think this step was needed, but it seems to be required.

4. At this point SYS 64738 will bring back the computer with the *Quick Brown Box* out of the picture.

As a final word of warning, do not operate the *Quick Brown Box* in an expansion chassis with the power to its slot turned off. This will increase the drain on the battery to 25 times the normal amount when the computer is turned on. Normally the battery is not used at all while the computer is on.

Conclusion

The *Quick Brown Box* is a worthy product whose availability is long overdue. The ability to rapidly secure your work in non-volatile RAM will easily justify the *Quick Brown Box* for any programmer. In this case the 64K *Quick Brown Box's* option of online libraries is just icing on the cake. The use of the *Quick Brown Box* with commercial software will of course be somewhat limited. Most commercial programs will require access to the RAM which is hidden by the *Quick Brown Box* in its active state. Thus the *Quick Brown Box* will be most attractive to programmers on the C-64 and the C-128 computers.

Brown Boxes, Inc., 26 Concord Road, Bedford, MA 01730 (phone: 617-275-0090). *—Morton Kevelson*

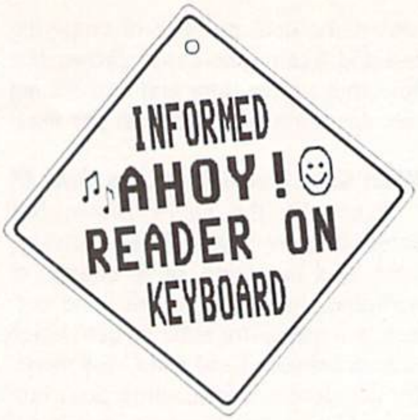
CAR SIGN DESIGNER

Zebra Systems, Inc.
Commodore 64
Price: $29.95

Just when we think we've seen every possible application for the C-64, someone comes up with a new idea. In this case it involves those little yellow diamonds, complete with witty phrases, which wiggle in automobile windows all across America. Now you will no longer have to depend upon the wit and wisdom of the commercial purveyors. With the *Car Sign Designer* you can propound your own philosophy from your back window.

The *Car Sign Designer* comes with everything you will need to design and install your own car signs: 50 sheets of printer paper in regulation yellow, a pair of reusable sign holders complete with suction cups, and of course a program disk. You will have to supply your own C-64 and a compatible dot matrix printer.

The resolution of your printer will have some effect on the quality of the car signs created. However, even a 1525 printer with a fresh ribbon should give satisfactory results. The program's printing routines may be customized for a selection of 17 popular printers.



Car Sign Designer ***permits a maximum of four lines of 15 characters each.***
READER SERVICE NO. 142

We tried out our sample on the Star Micronics Gemini 10X with perfectly satisfactory results. In our case the printing required more than 18 minutes. This time is a direct indication of the cogitation required to generate the high resolution characters which are the mark of quality of a properly crafted car sign.

The message space on a sign created with *Car Sign Designer* is limited to a maximum of four 15 character lines. Although this may cramp the style of some designers, it should be more than sufficient for many others. As of this writing we know of no standard for car sign capacity. The permissible character set consists of the upper case alphabet, punctuation, numbers, a heart, some musical notes, and a smile face.

The onscreen editor, although rather limited when compared to most word processors, was more than adequate for the task. We did not consider the lack of a text save feature to be a major shortcoming for this application. The size of the onscreen characters is automatically reformatted to accommodate the length of the line. Readability of the top and bottom lines suffers as the 15 character limit is approached. This is purely a problem of limited screen resolution, as the printed sign comes out just fine.

If you're looking for a special gift for your computer friend who already seems to have every type of software you can think of, *Car Sign Designer* may be just the thing.

Zebra Systems, Inc., 78-06 Jamaica Ave., Woodhaven, NY 11421 (phone: 718-296-2385). *—Morton Kevelson*

C-128 HELPER
Computer Mart
Commodore 128
Price: $24.95

The C-128 may very well be the best eight bit computer ever produced. Part and parcel of the machine is its extended BASIC 7.0 programming language. The HELP command that's included in BASIC 7.0 provides some after the fact programming support. In the event of a SYNTAX ERROR, the HELP command can be used to highlight the offending part of a program line. The C-128 even includes a dedicated function key for this purpose.

Although any sort of programming help is not to be sneered at, the fact is that the most help is required while actually writing a program. The extended command set of BASIC 7.0 results in many a trip to the reference section of the *C-128 System Guide.* The *C-128 Helper*, among other things, assigns a complete reference section to the C-128's HELP key.

The *C-128 Helper* is provided on a flippy formatted 1541 disk. Side one of this disk contains the BASIC 7.0 help files, while side two is filled with generic C-128 system information. To install *C-128 Helper* simply run the BASIC loader program on the disk. This loader program can be modified by the user to customize the operating environment such as screen colors. The loader program installs *C-128 Helper's* machine language driver into the RAM bank 0 at $1300 to $1BFF. This block is set aside by the operating system for machine language utilities such as *C-128 Helper.* In addition, 12 kilobytes at the top of RAM bank 1 is also reserved for *C-128 Helper's* main menu screen, current help screen, and a work screen.

As a result *C-128 Helper* does not affect the size of a BASIC 7.0 program; however, it does reduce the space allocated for variable storage. This should not be cause for concern, as *C-128 Helper* is intended for use during program development when memory requirements for variable storage may be kept to a minimum. When the completed program is run without *C-128 Helper*, the full variable storage capacity will be restored.

After installation, control is returned to the C-128's operating system and BASIC 7.0. The only difference is the assignment of the HELP key. Pressing the HELP key issues a SYS command which invokes *C-128 Helper.* If the cursor is on the last screen line when HELP is pressed, the screen will scroll up one line. Otherwise the appearance of the screen will not be affected when *C-128 Helper* is exited. *C-128 Helper* actually tidies up the screen by erasing the SYS command which was used to invoke it. In addition, if you had defined a window before asking for help, it will still be there when you get back. Note that BASIC 7.0's original HELP command can still be invoked by entering directly from the keyboard.

When invoked, the first thing *C-128 Helper* does is display the current main menu which actually represents the contents of the help files on the currently selected help disk. Note that *C-128 Helper* requires the use of the 80 column display. The amount of information which *C-128 Helper* is designed to display does not fit on a 40 column screen. If you are working in 40 column mode, *C-128 Helper* will prompt you to switch to the 80 column display. Any time you have a help file on the 80 column screen it can be sent to the printer with a touch of the C-128's COMMODORE key.

If required, you can display additional instructions on how to use *C-128 Helper* by simply pressing the HELP key a second time. If you wish help on one of the topics displayed on the main menu, simply enter enough of its name, followed by an asterisk, to uniquely identify the topic. In the case of the BASIC 7.0 command, you will be presented with a screen full of information. This screen includes the syntax of the command, a brief description of its function, a page reference to the *C-128 System Guide,* one or more examples of how the command is used, and a reference to related commands.

Each help file is recalled from the disk when it is required. On a 1571 disk drive the recall process takes only two or three seconds. Even on a 1541 the recall time will be only four or five seconds, as the files are saved in compressed format and usually occupy less than one kilobyte of disk space. Since the number of help topics may exceed 144, the limit to the number of files on a 1541 disk, *C-128 Helper* uses a

custom directory format to handle a larger number of files. This means that although *C-128 Helper* is not copy protected, you will still have to use a whole disk copier to back up the disk.

C-128 Helper is not a closed system. It includes the ability to modify its own help files, to create new help files, and to create entirely new help disks to go with it. It is provided with two disk sides full of help files. A new help disk may be logged in by pressing the C-128's ALT key. To provide for the creation of your own help files, an Editor program is included on the distribution disk. The Editor lets you create a new help screen or modify an existing screen, which of course is always limited to a single screen full of text.

All of the C-128's full screen editing features, including the new ESCape code sequences, are available in the Editor. In addition, all of the 80 column display features, such as flashing characters, colors, underlining, and the alternate character set, can be used to dress up the display. The Editor even lets you define a single macro to help speed up screen creation. Finally, the Editor lets you "drag" the cursor across the screen, via the individual cursor keys, to set the attributes of blocks of text.

C-128 Helper does provide for some flexibility with the use of disk drives. The default drive is a 1541 or 1571 as device number 8. The default device number may be easily changed by POKEing a value into address 4894. For dual drives the drive number is stored in address 4959. For multiple drive users the manual suggests that you program two or more function keys with the appropriate POKE commands to let you easily access the various disk drives. If you have a 1581 3½" disk drive, Computer Mart will provide you with a copy of *C-128 Helper* on a 1581 format disk for an additional $7.50. The 1581 could be an ideal environment for *C-128 Helper* in view of the drive's faster speed and high storage capacity.

We felt that *C-128 Helper* should have included additional mass storage support. As presently provided there does not seem to be any way to set *C-128 Helper* to run from a double sided 1571 format disk. This alone would double the number of online help files. Then again, there doesn't seem to be enough space on a single 80 column screen for that many help topics. Optional support of the 1750 RAM Expansion Module would also have been a tremendous boon. Transferring the help files to the 1750 would result in virtually instantaneous help at the touch of a key. This would have the added bonus of freeing up the disk drive for other uses.

Overall we feel that *C-128 Helper* is a well thought out, useful utility for the BASIC 7.0 programmer on the C-128. The ability to expand and customize its help files will insure that *C-128 Helper* will not become obsolete. In fact *C-128 Helper* need not be restricted to just help files. Possible applications include appointment calendars, notepads, and online help for other programs. Of course, *C-128 Helper* may not work with most commercial programs; however, it should work just fine with most BASIC applications.

Computer Mart, 2700 NE Andresen Rd., Vancouver, WA 98661 (phone: 206-695-1393). *—Morton Kevelson*

TIPS AHOY!

Compiled by Michael R. Davila

AMIGA TIPS NOW ACCEPTED

Programming tips and hardware hints for the Amiga, as well as for the C-64 and C-128, will henceforth be welcome in *Tips Ahoy!* Send your best work to

Tips Ahoy!
c/o Ion International Inc.
45 West 34th Street—Suite 500
New York, NY 10001

If your routine is over 10 lines in length, it must be submitted on disk. If you want your submission returned, it must be accompanied by a stamped and self-addressed envelope.

POINTERFIX

You're in the middle of writing a long BASIC program when you realize you need to load a machine language routine. You know it will mess up BASIC's pointers, and if you do NEW to fix the pointers, that will wipe out the BASIC program. Your options include:

1. If your general programming utility is active and has an UNNEW command (perhaps called OLD), go ahead with the load, NEW, and then use UNNEW to recover the program.

2. Save the BASIC program, load the ML routine, NEW, and reload your BASIC program.

3. Add two temporary lines to your BASIC program:

```
0 STOP
63999 LOAD"(programname)",8,1
```

RUN 63999, then delete the two temporary lines.

Or you might prefer to have three or four copies of *Pointerfix* on disk or tape with different load addresses. Choose one that does not conflict with anything else in memory, load it by name with the ,8,1 suffix (,1,1 for tape), and execute it by the proper SYS. That will fix all pointers. Then you can bring in any other ML routine that loads the same way, and execute *Pointerfix* again to fix the pointers again. Your BASIC program will be intact.

This loader/saver program lets you put the 22-byte *Pointerfix* routine anywhere memory space is available and save it to disk or tape. Some good start addresses are 49152; 52201 (just below the Wedge); anywhere in the 679-767 block; or anywhere in the cassette buffer area 820-1023 (if you plan to use disk only). The saving process automatically includes the proper SYS address as a part of the routine's name. If saved from a starting address of 49152, the saved routine's name will be "POINTERFIX 49152".

—C.C. Stalder
Orlando, FL

```
•100 REM "POINTERFIX.BDL"  LOADER/SAVER
•110 PRINT"ENTER START ADDRESS DESIRED"
•120 INPUT"FOR MACHINE CODE";SA:SA$=STR$(
SA):EA=SA+22
•130 FOR N=SA TO SA+21:READ D:CS=CS+D:POK
E N,D:NEXT
•140 IF CS<>1883 THEN PRINT"ERROR IN DATA
 STATEMENTS.  RECNECK":END
•150 PRINT:PRINT"LOADED OK.  TO EXECUTE D
O SYS";SA
•160 SH=INT(SA/256):SL=SA-256*SH:EH=INT(E
A/256):EL=EA-256*EH
•170 PRINT:INPUT"SAVE TO DISK OR TAPE  (D
/T)";K$:IF K$<>"D" AND K$<>"T" THEN170
•180 IF K$="D" THEN SYS 57812 "POINTERFIX
"+SA$,8:GOTO200
•190 IF K$="T" THEN SYS 57812 "POINTERFIX
"+SA$,1
•200 POKE 193,SL:POKE 194,SH:POKE 174,EL:
POKE 175,EH:SYS 62954
•210 PRINT:PRINT"DONE":END
•220 DATA 32,51,165,24,165,34,105,2
•230 DATA 133,45,165,35,105,0,133,46
•240 DATA 32,89,166,76,116,164
```

RESET

Ye Olde Disk Drive Lockup...the kind that has your drive in a state of rigor mortis. It won't load. It won't save. Heck, it won't even roll over and play dead dog. It just sits there like a lump of plastic trash. Fast load programs and cartridges can really increase the frequency of this fifth dimension scenario. What to do? The common approach is to remove the disk, switch off the drive, switch it back on, reinsert the disk, and continue on. That's fine if it's an occasional lockup. But if it happens with relentless regularity, you may find yourself permanently listing to port, or starboard as the case may be, waiting for the next calamity. Besides, the flashing light that often accompanies lockups can have you launching the first disk drive frisbee in history.

There is a better way. *Reset* is a short little routine that hides in memory awaiting your plea for help. It works with the C-64 and C-128 using either a 1541 or 1571 disk drive. SYS to it and the drive resets itself as if you had just switched it on. It unlocks the rigor mortis and douses any flashing light that may be present. It's great to keep in memory when you're using fast load programs. They definitely have a penchant for jamming the drives.

Reset is fully relocatable by changing the variable S in line 1. It's currently set for location 700 on the C-64. If you're using a C-128 in C-128 mode, be sure to change S to 3072 or 4864 or some other compatible location.

—Buck Childress
Salem, OR

```
•1 S=700:REM *** CHANGE TO 3072 FOR THE C
-128
•2 FORJ=STOS+43:READA:POKEJ,A:X=X+A:NEXTJ
:PRINT
```

BACK ISSUES OF Ahoy!

#2—FEB. '84 Illustrated tour of the 1541! Artificial intelligence! Synapse's Ihor Wolosenko interviewed! String functions! And ready to enter: Music Maker Part II! Screen Manipulation! Night Attack! Relative Files!

#3—MAR. '84 Anatomy of the 64! Printer interfacing for VIC & 64! Educational software series begins! VIC game buyer's guide! And ready to enter: Address Book! Space Lanes! Random Files on the 64! Dynamic Power!

#5—MAY '84 Future of Commodore! Inside BASIC storage! Memory management on the VIC & 64! Guide to spreadsheets! Hurray for arrays! And ready to enter: Math Master! Air Assault! Biorhythms! VIC Calculator!

#6—JUNE '84 Game programming column begins! Code generating programs! Rupert on inputting! Memory management continues! And ready to enter: Post Time for the 64 & VIC! Alpiner! Sound Concept!

#7—JULY '84 MSD dual disk drive! Database buyer's guide! Training your cursor! Screen displays! File Sleuth! Users Groups! And ready to enter: Renumbering! Checklist! Math Defender! Brisk! What's My Job?

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#11—NOV. '84 Music programs & keyboards for the 64! Graphics feature continues! 2-D arrays! And ready to enter: PTE word processor! Block Editor! Alternate Character Set for the 64! Tunnel of Tomachon!

#12—DEC. '84 Buyer's guide to printers! 1525 printer tutorial! Fast graphics with custom characters! User Guide to KMMM Pascal! Diving into BASIC! And ready to enter: Construction Co.! Space Patrol! Cross Ref!

#13—JAN. '85 VIC and 64 OS exposed! Sprites! Insert a 1541 device # disconnect switch! Ghostbusters! And ready to enter: Ultra Mail! Music Tutor! Alice in Adventureland! Midprint! To the Top! Tape/Disk Transfer!

#14—FEB. '85 Printer interfacing! Multicolor sprites! Modems! Bulletin Boards! Theory of game design! Buying a modem! And ready to enter: Futurewar! Fontasia! VIC Eraser! Insurance Agent! Flankspeed! Telelink 64!

#15—MAR. '85 Creating multiscreen gameboards! Inside the Plus/4! Commodore DOS! And ready to enter: Old Routine! Programmable Functions! Automatic Line Nos.! Home Budget! Salmon Run! Numerology!

#16—APR. '85 Assembly language column begins! Programming the joystick! 1541 disk drive alternatives! The Kernal! And ready to enter: Hop Around! Faster 64! Booter! Elecheck! BASIC Trace! Space Hunt!

#17—MAY '85 Disk drive enhancements! Install a reset switch! Assembler escapades! And ready to enter: Super Duper! Two-Column Directory! DSKDU! Raid! DOS Plus! Font Editor! Tile Time! Interrupt Wedge!

#18—JUNE '85 Music & graphics entry system! How modems work! Inside the 6510! And ready to enter: Quad-Print! Mapping 4.4! Towers of Hanoi! Speedy! Duck Shoot! Bit Dumping! Screen Magic! 6510 Simulator!

#19—JULY '85 PROM Programming! 3-part harmonies on VIC/64! Speeding pixels! And ready to enter: Auto-Append! Script Analysis! Wizard of Im! Lucky Lottery! Brainframe! Etch! Printat! Autos: Leasing v. Buying!

#20—AUG. '85 Inside the 128! Real-world simulations! Sound effects! Modems! And ready to enter: Windows! Formatter! Sound-a-Rama! Screen Dump! Selectachrome! Disintegrator! Fidgits! Gators N Snakes!

#21—SEP. '85 Inside the 1571 drive and 128 keyboard! Sprite programming! And ready to enter: Fastnew! Go-lister! File Lock! Dragon Type! Superhero! Auto-Gen! Moxey's Porch! Fish Math! Ahoy!Dock! Invective!

#22—OCT. '85 Create cartoon characters! Infinitesimal intrigue! Secrets of copy protection! And ready to enter: Shotgun! Maestro! Solitaire! Mystery at Mycroft Mews! Gravinauts! 1541 Cleaning Utility! Shadey Dump!

#23—NOV. '85 Guide to adventure gaming! ML sprite manipulation! BASIC for beginners! And ready to enter: Lightning Loader! Knight's Tour! Chopper Flight! Rhythmic Bits! Instant Bug Repellent! File Scout! Slither!

#24—DEC. '85 Speech synthesizer! The IBM Connection! The year's 25 best entertainments! And ready to enter: Gypsy Starship! Directory Manipulator! Cloak! Gameloader! Jewel Quest! Lineout! Santa's Busy Day!

#25—JAN. '86 Build a speech synthesizer! Survey of sports games! And ready to enter: Martian Monsters! Streamer Font! Microsim! Haunted Castle! Knockout! Infraraid! Alarm Clock! Memory Check! Scratch Pad!

#26—FEB. '86 Windows! Build an autoexec cartridge! Align your 1541! Survey of flight simulators! Structured programming! And ready to enter: Arena! Head to Head! Crabfight! Treasure Wheel! Character Dump!

#27—MAR. '86 Programming educational games! Memory dumpers! Choosing a copy program! Custom characters! And ready to enter: Ahoy!Term 128! Trivia Game Maker! Brickbusters! Easy Lister! Programmer's Aid!

#28—APR. '86 Comet catching! Survey of action and strategy games! Screen dumping! And ready to enter: Chrono-Wedge! Mr. Mysto! Air Rescue! Notemaker! Screen Window! JCALC! Hidden Cavern! Swoop!

#29—MAY '86 128 graphic bit map! Epyx strategy guide! 128 commands! ML music programming! And ready to enter: Bigprint! Star Search! Failsafe! English Darts! Ski Folly! Free RAM Check! Alchemist's Apprentice!

#30—JUNE '86 Debugging dilemmas! Public domain software! Winning at Ultima! Computer Aided Design! And ready to enter: LazyBASIC! Got A Match? Star Strike! Queen's and Bishop's Tours! Shaker! Trackdown!

#31—JULY '86 Inside the Amiga! Conditional branching! Chess programs! 128 and 64 DOS! And ready to enter: Screen Sleuth! Skull Castle! Head-on! Nebergall Run! Wordcount! Crazy Joe! Fidgits' Music School!

#32—AUG. '86 Inside the Amiga, part II! Approaching infinity! C-64 war simulations! Pascal for beginners! ML graphics! And ready to enter: Reversi! Highlight! Disk Cataloger! Meteor Run! Trim! Step On It! Flap!

#33—SEPT. '86 Windows and viewports! Sound & music on the 64! COMAL! And ready to enter: The Last Ninja! Speech64! Multi RAM! Dogcatcher! Trapped! Matchblocks! Variable Manager! Dual Dump! Mine Canyon!

#34—OCT. '86 Build a digital oscilloscope! ML speed techniques! And ready to enter: Vault of Terror! Quick Change! Penguins! Attack Force! Disk Checkup! Dvorak Keyboard! Mountaineer Mack! 128 to 64 Autoboot!

#35—NOV. '86 C-128 shadow registers! Data file handling! PROMAL! Habitat! And ready to enter: Teleporter! 128 RAM Check! Discs of Daedalus! Guardian! Tenpins! Syntax Patrol! Deluxe List! Long Lines! Detonation!

#36—DEC. '86 File manipulation! C-128 shadow registers! Football games! And ready to enter: The Artist! Minotaur Maze! Mouse in the House! Lazy Source Code! Rebels and Lords! Speedway! The Editor! Micro City!

#37—JAN. '87 Pointers and the monitor! Best games of '86! DOS for beginners! And ready to enter: Vortex! Hanger 14! BASIC Ahoy! Catacombs! Lixter! Dark Fortress! PermaLine! Starfighter! Bugout! Screens!

#38—FEB '87 Hacking into machine language utilities! Amiga RAM expanders! And ready to enter: Window Magic! Crunchman! User Conventions! The Adventurer! More BASIC 128! Jailbreak! Turtle Rescue! 640!

#39—MAR. '87 Basic esthetics! Survey of video digitizers! Multiplayer games! And ready to enter: C-64 Compressor! Wizard Tag! Turbopoke! Rescue 128! Lights Out! Pinball Arcade! Stow Away! Caverns of Geehonk!

#40—APR. '87 Inside the Amiga 2000! Fractals! Baseball games! COMAL, turtle graphics, and Logo! And ready to enter: Infoflow! Laps! Piemen! List Formatter! Scrambler! Extended Background Mode! Planet Duel!

#41—MAY '87 Kernal power! 64 and Amiga graphics! Microworlds in COMAL! Brain games! Dark Fortress master maps! And ready to enter: Moondog! Startup! Illusion Master! Wall Crawler! Scavenger Hunt!

#42—JUNE '87 Megaflops and microseconds! Sci-fi braingames! C-64 to Amiga file transfer! And ready to enter: D-Snap! Wraiths! Galactic Cab Co.! Cave of the Ice Ape! ALT-Key 128! Power Squares! 128 Multi RAM!

#43—JULY '87 Real world interfacing! Bit map graphics tutorial! C-64 graphic conversion! Martial arts software! And ready to enter: Wizard Tag II! Data Creator! Plink & Plonk! Univaders! Data Express! 128 Scroller!

#44—AUG. '87 Electronic screen swapping on the C-128! Science fiction action games! The death of GOTO! Amiga reviews! And ready to enter: Archer! Banner Print! Route 64! Steeplechase! Batter Up! Scanner!

#45—SEP. '87 The 128 versus The Clones! Building an Amiga trackball! MSD update! CES Report! And ready to enter: Crystallus! Spriteshell! Hoops! Chainmail! No News! PS to GEOS! Centerfold! Red Alert!

#46—OCT. '87 A rainbow of data structures! BASIC 8.0 reviewed! Buying guide to COMAL! Tips Ahoy! Art Gallery! And ready to enter: Empire! C-64 RAMDrive! Hotfoot! Platforms! Spray-Cam! Jam Attack!

#47—NOV. '87 The ins and outs of data organization! Overview of C-64 memory expanders! Commodares! And ready to enter: Orbit! RAMCO! A-Maze-Ing! Line Sentry! Desert Front! Paper Route! Flash Flood!

#48—DEC. '87 Exploring artificial intelligence! Expansion port tutorial! Memory expanders! And ready to enter: Redirect! Silhouette! Fueling Station! Take Two! Pizza Boy! Sprite-On! Warship! Cliffhanger!

#49—JAN. '88 Iterative mathematics and graphics! Expansion port tutorial, part III! The best C-64 and Amiga games of 1987! And ready to enter: Infoflow 64! TextSave! Clone-A-Matic! Ice Titans! Jungle Jake!

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```
•3 IFX<>6140THENPRINT"ERROR IN DATA[3"."]
":END
•4 PRINT"DATA OK * SYS"S"TO RESET DRIVE[3
"."]":END
•5 DATA169,15,162,8,168,32,186,255,169,0,
32,189
•6 DATA255,32,192,255,162,15,32,201,255,1
69,85,32
•7 DATA210,255,169,59,32,210,255,169,13,3
2,210,255
•8 DATA32,204,255,169,15,76,195,255
```

LISTER-SEEN

Long lists got you down? Are all those lines beginning to look like one great big mud pie? Do your eyeballs feel like they're turning into mush? Well, keep the oatmeal in the bowl and your eyes in their sockets with *Lister-Seen.* Whenever you list a program, *Lister-Seen* prints each line in a contrasting color...easy to tell the lines apart and refreshing to your eyes.

After running *Lister-Seen* to get the data into memory, type SYS 53000 and press RETURN. Now there'll be some zip in the ol' list.

To deactivate *Lister-Seen,* press RUN STOP RESTORE. SYS 53000 reactivates it. —Buck Childress
Salem, OR

```
•1 REM *** LISTER-SEEN ***
•2 PRINTCHR$(147)"LOADING";:FORJ=53000TO5
3149
•3 READA:POKEJ,A:X=X+A:PRINT".";:NEXTJ
•4 PRINT:PRINT:IFX<>21349THENPRINT"ERROR
IN DATA[3"."]":END
•5 PRINT"DATA OK [3"*"] SYS 53[3"0"] TO A
CTIVATE[3"."]":END
•6 DATA169,160,162,0,133,252,134,251,142,
158,207,161
•7 DATA251,129,251,230,251,208,248,230,25
2,165,252,201
•8 DATA192,144,240,169,76,162,74,160,207,
141,209,166
•9 DATA142,210,166,140,211,166,162,140,16
0,207,141,20
•10 DATA167,142,21,167,140,22,167,120,169
,47,162,54
•11 DATA133,0,134,1,88,96,173,33,208,41,1
5,141
•12 DATA159,207,174,134,2,173,158,207,208
,6,142,160
•13 DATA207,238,158,207,138,205,160,207,2
40,6,173,160
•14 DATA207,76,121,207,24,105,8,41,15,205
,159,207
•15 DATA208,3,170,232,138,141,134,2,32,22
5,255,208
•16 DATA8,8,32,146,207,40,32,47,168,76,21
2,166
•17 DATA32,146,207,76,134,227,169,0,174,1
60,207,141
•18 DATA158,207,142,134,2,96
```

TRAPPED

You finally finished typing the last line of your C-128 program. After saving it, you decide to run it. Suddenly, the ominous error occurs. You can hit the HELP key to highlight the error, but what happens if there are errors up to your neck? Your finger might start to get sore from hitting the HELP key all the time. To solve this problem, enter these two lines at the beginning of your BASIC program:

```
1 TRAP2:GOTO10
2 SCNCLR:HELP:PRINT"TYPE OF ERROR: ";ERR
$(ER):PRINT:PRINT:PRINT"LIST";EL;CHR$(14
5);CHR$(145);:POKE842,13:POKE208,1:END
10 your BASIC program starts here
```

Now every time you run your program and an error occurs, the line with the highlighted error is displayed along with the type of error and the original line. The original line is displayed for your editing convenience. Get rid of those bugs without spraining your finger.

—Michael Jaecks
Alamogordo, NM

CORKSCREW

Want to add some zing to your screen? Give it some bub-

bly with *Corkscrew*. Just add *Corkscrew* to your programs and watch the screen come alive with a colorful gyroscopic effect.

Corkscrew is great for title and help screens, or any time you need to add a little pizzazz to those slow moments. It works on both the C-64 and the C-128 with a 40 column display.

You can check out *Corkscrew* by itself. Just run it the way it's listed and watch the screen.

Here's something to remember, though. If you GOSUB to *Corkscrew* from within a program, be sure to change line 63012 to RETURN. —Buck Childress
Salem, OR

```
•63000 A=55747:B=55764:C=55867:D=55884
•63002 PRINT"[CLEAR][BLACK]";:A$="[RVSON]
 [39" "][RVSOFF]":REM 39 SPACES
•63004 FORG=1TO24:PRINTA$:NEXTG:PRINTA$"[
 HOME]"
•63006 E=0:FORF=1TO10:GOSUB63014:NEXTF
•63008 A=A-41:B=B-39:C=C+39:D=D+41
•63010 E=0:FORF=1TO10:GOSUB63016:NEXTF
•63012 GOTO63012:REM CHANGE TO RETURN IF
 YOU HAD A GOSUB COME TO THIS ROUTINE
•63014 A=A-41:B=B-39:C=C+39:D=D+41:GOTO63
 018
•63016 A=A+41:B=B+39:C=C-39:D=D-41
•63018 E=E+1:FORG=A+1TOB:POKEG,E:NEXTG
•63020 FORG=BTODSTEP40:POKEG,E:NEXTG
•63022 FORG=DTOCSTEP-1:POKEG,E:NEXTG
•63024 FORG=CTOASTEP-40:POKEG,E:NEXTG:RET
 URN
```

WORDWRAP 128

If you'd like to format your information professionally, you might want to try this one-liner to correctly break any string on the border. Pass the string in A$ to the subroutine at line 110 and watch it roll across your monitor with class. It will also save you memory space in programs, because you'll be able to eliminate needless spaces in lines that adjust the output for the border.

—Cleveland M. Blakemore

```
•10 REM WORDWRAP 128
•20 REM CLEVE BLAKEMORE A.K.A. TEX ARCANE
•30 D=39:REM CHANGE TO 79 FOR 80 COLUMNS
•40 SCNCLR:PRINTCHR$(13)CHR$(13)CHR$(13)C
 HR$(14)
•50 A$="[s T]HIS IS A ONE-LINE WORD WRAP
 UTILITY FOR THE [s C]128 THAT ASSURES NO
 NE OF THIS OR ANY OTHER STRING WILL BREA
 K ITSELF IN AN UNSIGHTLY MANNER ON THE B
 ORDER."
•60 GOSUB110
•70 A$="[s I]T IS USEFUL FOR [s B][s A][s
  S][s I][s C] WORD PROCESSING,TEXT ADVEN
 TURES,INSTRUCTION PAGES,OR ANY APPLICATI
 ON THAT USES LONG STRINGS OF INFORMATION
 [3"."]"
•80 GOSUB110:END
•90 REM ONE-LINE WORD WRAP
•100 REM PASS STRING IN A$ TO SUBROUTINE
•110 L=LEN(A$):X=1:DO:W$="":DO:L$=MID$(A$
 ,X,1):W$=W$+L$:X=X+1:LOOPUNTILL$=" "ORX>
 L:PRINTCHR$((POS(.)+LEN(W$)>D)*-13);W$;:
 LOOPUNTILX>L:RETURN
```

3-D CITY MAKER

You might just be designing another *Space Invaders* rip-off, but it will look like a whole new game with this nine line program that creates a three-dimensional city of buildings, complete with proper shading. You could try this little ditty with any application that requires a metropolitan backdrop. —Cleveland M. Blakemore

```
•1 POKE53281,.:POKE53280,.:PRINTCHR$(147)
 :FORG=9TO23STEP4:FORX=.TO7
•2 A=(RND(1)*2)+11
•3 POKE783,.:POKE782,X*5
•4 D=(RND(1)*8)+1
•5 POKE781,G:SYS65520:POKE646,A:PRINT"[RV
 SON][4"[c D]"][c 8][RVSOFF][sEP]":POKE64
 6,A
•6 FORC=1TOD:POKE781,G-C:SYS65520
•7 PRINT"[RVSON][4"[c D]"][c 8] ":POKE646
 ,A:NEXT
•8 POKE781,G-C:POKE782,X*5:POKE783,.:SYS6
 5520:PRINT"[RVSON][c 8][sEP][3"[c @]"][s
 N]"
•9 NEXT:NEXT:PRINT"[HOME]":WAIT198,1
```

SCROLL FADE IN

Need that special touch to your special program? Use this short routine and amaze your friends. The program will scroll and fade in a string of characters to your screen. You must put your message into the variable A$, the starting screen line location to print into S, and the ending screen line location into E. If that sounds confusing, lines 20-30 are examples to help illustrate this. S must be greater than E. Now, see what it can do for your games. —John Fedor
Lindenhurst, IL

```
•10 POKE53280,0:POKE53281,0:PRINT"[CLEAR]
 [WHITE]":C$="[WHITE][c 8][c 5][c 4][BLAC
 K]":D$="[HOME][24"[DOWN]"]"
•20 A$="HELLO":S=24:E=1:GOSUB60000
•25 A$="&":S=24:E=3:GOSUB60000
•30 A$="GOOD-BYE":S=24:E=5:GOSUB60000
•40 END
•60000 FORX=STOESTEP-1:FORY=0TO(S-X)+(X<S
 -4)*(S-4-X)
•60010 PRINTLEFT$(D$,X+Y)TAB(20-LEN(A$)/2
 )MID$(C$,Y+1,1)A$"[HOME]":NEXTY,X
•60020 FORC=2TO5:FORY=1TO5-C
•60025 PRINTLEFT$(D$,E+Y)TAB(20-LEN(A$)/2
 )MID$(C$,C+Y,1)A$"[HOME]"
•60030 NEXTY,C
•60035 RETURN
```

COMMODARES

PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Put *your* name and address on the listings as well. Show sample runs if possible. Briefly describe your solutions and tell what makes them unique or interesting, if they are. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares!*

PROBLEM #50-1: PHONE DECODE

This problem was submitted by Pat McConville (Manassas Park, VA). Write a program to decode the encoding scheme described in *Problem #46-2* discussed below. All letters have a two-digit code. Q has a code value of 77, and Z is number 99. For all other letters, the first digit is the telephone keypad number for that letter. The second digit is a 1, 2, or 3, corresponding to the letter's position on that key. The user enters a sequence of numbers separated by commas. The computer displays the corresponding letters. For example, if the user enters 21, 99, 53, the computer returns AZL.

PROBLEM #50-2: SHORT SOUND

From Ernest Barkman (Athens, NY): What is the shortest program which can generate a continuous sound on the C-64 or the C-128? Ernest's one-liner uses 22 characters (or 18 keystrokes using command abbreviations).

PROBLEM #50-3: TRICKY INDEX

Justin H. Smalley (Boulder, CO) suggested this challenge. Start with this program to print out an array of data.

```
10 L=17 : NC=5 : NR=INT(L/NC)
20 FOR R=0 TO NR : K=R*NC : FOR C=1 TO N
C
30 I=K+C : IF I>L THEN END
40 PRINT I; : NEXT : PRINT : NEXT
```

This prints out the array of 17 numbers in 5 columns. NR is the number of complete rows. The result is this:

```
1  2  3  4  5

6  7  8  9  10

11 12 13 14 15

16 17
```

Your problem is to replace line 30 so that when the index I is printed in line 40, the result is this:

```
1  5  9  12 15

2  6  10 13 16

3  7  11 14 17

4  8
```

It has the same number of columns and complete rows as before, but the numbers are arranged vertically.

PROBLEM #50-4: SIMPLE SIMON

Write the simplest program possible to create the Simon number-sequence memory game. The computer displays three numbers briefly, then erases them. The user must enter the three numbers in correct order. The computer then adds one more number to its list and displays it briefly. The user must enter the four numbers in correct order. This process continues until the user fails to enter the list correctly. Remember, simplicity is the key.

This month we will look at the most interesting solutions to *Commodares* from the October 1987 issue of *Ahoy!* We will start with *Problem #46-1: Color Bars*, by Jim Speers (Niles, MI). The problem was to write a simple program which lets the user move a cursor along a color bar to select border, background, and text colors.

The following program from TBR (Littleton, CO) provides a nice user interface in a short, well-documented program:

```
•1 REM ==================================
•2 REM   COMMODARES PROBLEM #46-1 :
•3 REM          COLOR BAR
```

```
•4 REM          SOLUTION BY
•5 REM              TBR
•6 REM == C-64 OR C-128 IN 40 COLUMNS ==
•10 PRINT"[CLEAR][5"[DOWN]"]USE CRSR KEYS
 TO SELECT;<RETURN> CHANGES
•15 KLR=241 : IF FRE(0)=FRE(1) THEN KLR=6
46
•19 REM SET UP COLOR BAR
•20 FORI=0TO15:POKE1144+I,160:POKE55416+I
,I:NEXT
•29 REM SET UP SELECTION BAR
•30 PRINT"BORDER":PRINT"SCREEN":PRINT"CHA
RACTER"
•39 REM PLACE ARROWS ON SCREEN
•40 A$="[UPARROW]":B$="[BACKARROW]":GOSUB
80:GETK$:IFK$=""THEN40
•49 REM MOVE ARROWS
•50 A$=" ":B$=" ":GOSUB80:X=X+(K$="[LEFT]
")-(K$="[RIGHT]"):Y=Y+(K$="[UP]")-(K$="[
DOWN]")
•59 REM ADJUST MOVEMENT TO LIMITED RANGE
•60 X=X+(X>15)-(X<0):Y=Y+(Y>2)-(Y<0):IFK$
<>CHR$(13)GOTO40
•69 REM CHANGE COLORS
•70 IFY<2THENPOKE53280+Y,X:GOTO40
•75 POKE KLR,X:GOTO10
•79 REM PLACE/ERASE ARROWS
•80 PRINT"[HOME][4"[DOWN]"]"TAB(X)A$:FORI
=0TOY:PRINT:NEXT:PRINTTAB(10)B$:RETURN
```

Simply move the cursors to choose the function and the color. Press the RETURN key to make your selections. Press RUN STOP when done. I modified the program slightly so that it can be used with the C-128 in 40-column mode as well. The text color value is stored in location 241 in the C-128 and in location 646 for the C-64. The FRE statements in line 15 are equal for the C-64 but usually not for the C-128. The screen foreground and background colors are stored in the same location in both machines, 53280 and 53281.

In line 20 the color bar block character CHR$(160) is POKEd into screen locations 1144 through 1159. The corresponding color memory locations in 55416 through 55431 are filled with the color values. Notice how the values of the cursor-position variables X and Y are changed in line 50. K$ is the keyboard input. If it is a "cursor left", the expression K$="[crsr left]" is true and therefore has the value −1. This decreases the value of X by 1. Likewise, if K$="[crsr right]", the value of X is increased by 1 because of the minus sign in the formula. A similar formula causes Y to change as the vertical cursor is moved.

Line 60 prevents the cursors from moving outside their limits. If X has just been incremented to 16, for example, the first statement in line 60 reduces it back to 15.

There were multitudes of other solutions to this problem. Some required the use of the function keys. I prefer to leave my function keys the way I set them during boot-up. Some other solutions did not cause the color changes to occur immediately. It is nice to get immediate feedback. Good job, TBR (whoever you are).

Edgar Losberg (Huntsville, AL) sent an interrupt-driven routine for the C-64 which uses the function keys to set the colors, even within another program. Edgar sent a well-commented assembler listing as well as a BASIC loader. Timothy Berry (Arlington, TX) sent an interesting solution for the C-128 which uses sprites and a joystick to select the colors. If you would like a copy of either of these listings, send me a self-addressed stamped envelope with your request clearly stated.

Problem #46-2: Phone Code was submitted by Wallace Leeker (Lemay, MO). The problem was to convert a three-character symbol into its telephone keypad code. The keypad is arranged like this:

	ABC	DEF
1	2	3
GHI	JKL	MNO
4	5	6
PRS	TUV	WXY
7	8	9

The code for each letter is a two-digit number. The first digit is the key number, and the second digit is the letter's position (1, 2, or 3) on that key. For example, CBM is encoded 23, 22, 61. Q is given the code 77 and Z is 99 since they are not on the keypad.

Here is a compact, no-frills solution from Judy Groth (Brooklyn, NY).

```
•1 REM ==================================
•2 REM    COMMODARES PROBLEM #46-2 :
•3 REM      PHONE CODE
•4 REM    SOLUTION BY
•5 REM      JUDY GROTH
•6 REM ==================================
•10 DIMV(26):INPUTA$(1),A$(2),A$(3):V(26)
=99
•20 FORKN=20TO90STEP10:FORLP=1TO3:C=C+1:V
(C)=KN+LP:IFC=17THENV(C)=77:LP=LP-1
•30 NEXT:NEXT:FORY=1TO3:FORX=65TO90:IFA$(
Y)=CHR$(X)THENPRINTV(X-64)
•40 NEXT:NEXT
```

You must enter three letters individually or separated by commas. The program returns the three codes. You might enjoy modifying this program to handle an input string of any length. Use the MID$ function to separate it into its characters. Replace the 3's in lines 20 and 30 with the length of the input string.

A nice feature of Judy's solution is that it doesn't require lengthy DATA statements or strings containing the alphabet, the way many of the solutions did. With fairly uniform data, it is easier to let the computer figure out the encoding mathematically.

The CHR$ statement in line 30 checks the letters A through Z for a match with the user input characters A$( ). If A$(1) is "C" for example, the match will be found for

X equal to 67 since CHR$(67) is "C". The V( ) array stores the codes for the 26 letters in alphabetical order. The PRINT statement selects element 3 of the V( ) array by subtracting 64 from the value of X, giving the code for "C".

Notice how the V( ) array is filled by stepping the key number KN by 10's while incrementing the letter's place value LP from 1 to 3. The last statement in line 20 is executed only for the 17th letter "Q".

Eddie Byrd (Caruthersville, MO) created an array of code values C( ) this way as part of his program:

```
1 FOR K=2 TO 9 : FOR P=1 TO 3
2 N = K * 10 + P        :REM CODE NUMBER
3 L = L + 1 - (N=72)    :REM LETTER
4 C(L) = N : NEXT : NEXT
5 C(17)=77 : C(26)=99
```

The statement in line 3 normally increments L by one every time through the loop except for the code number 72. In that case (N=72) is true and has the value −1. Therefore L is incremented by 2. That takes care of the gap created by the missing letter Q. Line 5 stores the correct codes for Q and Z.

Jim Speers used the INSTR ("in-string") function on the C-128 to find the position of K$, the chosen letter, in A$ where A$ is "ABCDEFGHIJKLMNOPRSTUVWXYQZ":

```
X = INSTR(A$,K$,1)-1
```

This gives X a value from 0 to 25. The encoded value is then calculated from this expression:

```
C = 10 * (INT(X/3) + 2) + (X - 3*INT(X/3
) + 1)
```

Q and Z must be handled separately.

Problem #46-3: Line Locator was a small challenge to find the location in memory of any specified program line. Craig Ewert (Crystal Lake, IL) sent the following solution for the C-64:

```
•1 REM ====================================
•2 REM     COMMODARES PROBLEM #46-3 :
•3 REM        LINE LOCATOR
•4 REM     SOLUTION BY
•5 REM        CRAIG EWERT
•6 REM ====== C-64 ONLY ================
•10 AD=2049 : INPUT"LINE SOUGHT";L : IF L
 <0 THEN END
•20 LP=PEEK(AD)+256*PEEK(AD+1) : LN=PEEK(
 AD+2)+256*PEEK(AD+3)
•25 REM  PRINT AD,LP,LN
•30 IF L<LN OR LP=0 THEN PRINT"LINE"L"DOE
 S NOT EXIST":GOTO 10
•40 IF L=LN THEN PRINT"LINE"L"STARTS AT"A
 D:GOTO 10
•60 AD=LP : GOTO 20
```

Program memory starts at address 2049. (Use PEEK(45) + 256*PEEK(46) instead of 2049 for the C-128.) The instructions in each program line are preceded by 4 bytes. Two are pointers to the next line and two are the current line number. Line 20 first calculates the pointer LP to the start of the next line. The pointer is stored in bytes 0 and 1. Then it calculates the line number of the current line LN. This is stored as bytes 2 and 3.

Craig's program is unique among those submitted because of line 30. This line tests to see if the chosen line number has already been passed. For example, if the user wants to locate line 500 (L=500), the statement in line 30 checks to see if the current line number LN is already greater than 500. If so, the "Line does not exist" statement is executed. That can be a timesaver if this utility is used with a long program. Craig had a separate line for the LP=0 test which I combined with line 30 to shorten the program. Recall from last month's discussion that the end of the program is found when the pointer value is zero.

If the selected line number is found, line 40 displays its starting address. You may terminate the program by entering a negative line number. The conditional test in line 10 handles that case.

You might find it interesting to watch the program in action. Remove the REM from line 25, then search for a large, non-existent line number. You will see three columns of numbers. The first column is the memory address. The second column shows the pointer value stored at that address.

The third column gives the line number of the line starting at the given address. Notice that the pointer value in one row equals the address value of the next row. Also notice that the pointer value at the last address is zero. The last number shown for that address is not really a line number.

Jim Speers took advantage of a user-defined function to arrive at this even simpler solution for the C-64 or the C-128.

```
1 REM ====================================
2 REM    COMMODARES PROBLEM #46-3 :
3 REM       LINE LOCATOR
4 REM    SOLUTION BY
5 REM       JIM SPEERS
6 REM ====================================
1000 L=43-2*(FRE(0)<>FRE(1)):DEFFNV(X)=P
EEK(X)+256*PEEK(X+1)
1010 INPUT"[DOWN][DOWN]LINE NUMBER";LN
1020 L=FNV(L)
1030 REM  PRINT L,FNV(L),FNV(L+2)
1040 IF FNV(L)=0 THEN PRINT"LINE NOT FOU
ND":END
1050 IF FNV(L+2)=LN THEN PRINT"LINE";LN"
STARTS AT LOCATION";L:END
1060 GOTO 1020
```

Jim uses a logical expression in line 1000 to calculate the Start of Program Text address. It is contained in addresses 43 and 44 for the C-64 and in addresses 45 and 46 for the C-128. Since FRE(0) equals FRE(1) for the C-64, the logical expression (FRE(0)< >FRE(1)) is false and has a value of 0. Therefore L is given a value of 43. Since the two FRE functions are not in general equal for the C-128, the inequality is true and has the value −1. Therefore the expression −2 * (FRE(0)< >FRE(1)3) is equal to two, giving L the value 45.

The user function FNV calculates the value of a two-byte pointer or of a two-byte line number, since both are stored the same way. Again you may delete the REM in line 1030 to watch the program in action. You could use this program as a subroutine within another program if you replace the END statements in lines 1040 and 1050 with RETURN statements.

Cecil Woods (Norton, OH) sent this BASIC loader for his C-64 assembly language solution to the problem:

```
1 REM ====================================
2 REM    COMMODARES PROBLEM #46-3 :
3 REM       LINE LOCATOR
4 REM    SOLUTION BY
5 REM       CECIL WOODS
6 REM ====  C-64 ONLY  ==============
10 PRINT"WORKING"
20 FOR X=40960 TO 49151
30 POKE X,PEEK(X):NEXT
40 POKE 41151,79:POKE 41152,195
50 FOR X=43429 TO 43448
60 READ A:POKE X,A:NEXT
70 POKE 1,6:PRINT"DONE":NEW
80 DATA 32,107,169,32,19,166,165,95
90 DATA 133,99,165,96,133,98,32,209
```

Ahoy! DISK

Why type in the listings in this month's *Ahoy!* when we've done it for you? All the programs in this issue are available on the current *Ahoy! Disk* for $8.95. Isn't your time worth more than that?

Use the coupon at the bottom of this page to order disks for individual months, a disk subscription, or the special anthology disks described below. (You can also subscribe to the *Ahoy! Disk Magazine*—disk and magazine packaged together at a special reduced rate. See the card bound between pages 66 and 67.)

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```
•95 DATA 189,76,134,227
```

Cecil said that lines 20-30 dump BASIC ROM into RAM. Line 40 changes the "ET" in "LET" into "OC" giving "LOC". Lines 50-60 put his routine into memory, and line 70 turns BASIC ROM off to enable the modified RAM version. The DATA statements store the machine language code.

The commented assembler listing describes the routine.

```
•1 REM ==================================
•2 REM    COMMODARES PROBLEM #46-3 :
•3 REM      LINE LOCATOR
•4 REM    ASSEMBLER LISTING
•5 REM      CECIL WOODS
•6 REM ====  C-64 ONLY  ===============
•10 :A9A5  JSR $A96B   ;GET LINE NUMBER
•20 :A9A8  JSR $A613   ;LOCATE LINE ADDR
•30 :A9AB  LDA $5F    ;PICK UP 1/2 OF ADDR
•40 :A9AD  STA $63    ;FOR DECIMAL CONVERT
•50 :A9AF  LDA $60    ;PICK UP OTHER HALF
 OF ADDR
•60 :A9B1  STA $62    ;USED FOR CONVERSION
•70 :A9B3  JSR $BDD1   ;CONVERT AND PRINT
 ADDR
•80 :A9B6  JMP $E386   ;GOTO WARM START
 (READY)
```

To use this program, type in the BASIC loader. Next, and *very* important, SAVE the program before you run it (since it erases itself). Then RUN the program. Now to locate the starting address of line 30, for example, just type LOC 30. This can be done at any time in direct mode with any program loaded.

Cecil mentioned a couple of minor shortcomings of this program. If you type L(shift-O) for the LOAD function, it picks up the LOC routine instead. Simply POKE 1,55 (reenable the ROM BASIC) and try again. Another minor problem is that if you request line 45 and your program has only lines 40 and 50, the LOC function returns the address for line 50. Also if you request a line number greater than any in your program, the routine returns the address of the start of variable storage at the end of your program text storage). Thanks for a very interesting solution, Cecil.

We will wrap it up this month with the shortest solution to *Problem #46-4: Character Billiards.* The problem was to create the simplest program to move the letter "O" around on the screen like a billiard ball. This program is a composite of the solutions from Manfred Klocek (Moodus, CT), Jim Lostetter (Kelseyville, CA), and Larry Schafer (Westphalia, MI).

```
•1 REM ==================================
•2 REM    COMMODARES PROBLEM #46-4 :
•3 REM      CHARACTER BILLIARDS
•4 REM SOLUTION SUGGESTED INDEPENDENTLY
•5 REM  BY   LARRY SCHAFER
•6 REM  AND  JIM LOSTETTER
•7 REM  AND  MANFRED KLOCEK
•8 REM ==================================
•10 PRINT"[CLEAR]":DX=1:DY=1
•20 G=1024+X+40*Y :POKE G,87 :FORI=1TO15
 :NEXT :POKE G,32
•30 Y=Y+DY:IF Y<1 OR Y>23 THEN DY=-DY
•40 X=X+DX:IF X<1 OR X>38 THEN DX=-DX
•50 GOTO 20
```

Their three solutions were so similar that I couldn't select one over the others. The program calculates screen locations for POKEing in line 20. The ball character is POKEd followed by a brief pause, and then a space character (32) is POKEd to erase it. Then the next horizontal and vertical screen locations are calculated in lines 30 and 40. If the ball is beyond any of the edges of the screen, the direction of motion (DX or DY) is changed to the opposite value. This creates the rebound effect.

You can have some fun with this idea. Instead of POKE G,32 in line 20, Rich Jones (Throop, PA) suggested that you POKE any other character value to see the interesting trail left by the ball. You might experiment with changing the color of the ball as Jim Speers did. You might also change its location or its direction of travel at random. The numbers in lines 30 and 40 define the size of the box in which the ball moves. You may change them as well.

The solutions from Bob Renaud (Pittsfield, MA), Nolan Whitaker (Jeffersonville, KY), and Jim Speers were all similar to this solution as well.

Not really a *Commodare* is this problem from Lew Lambros (Montgomery, AL). Lew wants to convert C-64 *Print Shop* graphics over to the Apple or IBM PC computers. If you have information on this, let me know and I will forward it to him.

Keep those challenges and solutions coming. The problems are as easy or difficult as you make them. See you next month. ☐

The following people not already mentioned this month are also to be congratulated for their solutions:

Irwin Aschkenas (Avondale Estates, GA)
Thomas Bermingham (Pine Hill, NJ)
Jim Besso (APO NY)
Rick Briggs (Porterville, CA)
Matthew Brock (Tucson, AZ)
David Clarke
Harlan Clussman (Wausau, WI)
Curt Donofrio (Shelton, CT)
Edward Grove (El Cajon, CA)
Robert Groysman (Fairlawn, NJ)
Alan Gutierrez (Forest Hills, NY)
Dale Ickes (Uhrichsville, OH)
Gary Jones (Williamsport, IN)
Yeechang Lee (Riverdale, NY)
John Newell (San Antonio, TX)
Jim Schuster (Fairpoint, OH)
Tab Trepagnier (Kenner, LA)
John Ward (Poulsbo, WA)

ERRATA

SILHOUETTE (December '87)

Due to a printing error, POKE 781,X of line 860 of *Silhouette* looked more like POKE 781.X. POKE 781,X is the correct way to type the line. We apologize for the inconvenience.

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!'s* program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

Call *Ahoy!* at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).

WHEN YOU SEE	IT MEANS	YOU TYPE		YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑ CRSR ↓	
[DOWN]	Cursor Down		↑ CRSR ↓	
[LEFT]	Cursor Left	SHIFT	← CRSR →	
[RIGHT]	Cursor Right		← CRSR →	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	↑
[BACKARROW]	Back Arrow		←	←
[PI]	PI		π	π
[EP]	English Pound		£	£

WHEN YOU SEE	IT MEANS	YOU TYPE		YOU WILL SEE
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent.* You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

C-64 BUG REPELLENT

```
·10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=49152
·20 FORB=0TO11:READA:IFA<0ORA>255THEN40
·30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
·40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
:END
·50 X=0:J=J+12:IFJ<49456THEN20
·60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
·70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
·80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
·90 POKE49456,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THE
ND=1:D$="TAPE"
·100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)";N
·110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
·120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
·130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):
NEXTJ:PRINT
·140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
·150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
·160 POKE770,131:POKE771,164:SYS49152:END
·170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
·180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
·190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
·200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
·210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
·220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
·230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
·240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
5
·250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
·260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
·270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
·280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
49
·290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
·300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
·310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
·320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
·330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
·340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
·350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
·360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
·370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
·380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
·390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
·400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
·410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
·420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500
```

C-128 BUG REPELLENT

```
·10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=4864
·20 FORB=0TO11:READA:IFA<0ORA>255THEN40
·30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
·40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
:END
·50 X=0:J=J+12:IFJ<5213THEN20
·60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D=
8:PRINTCHR$(147)
·70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
·80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
·90 POKE5213,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEN
D=1:D$="TAPE"
·100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0
-99)";N
·110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
·120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
·130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
·140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
·150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
·160 POKE770,198:POKE771,77:SYS4864:END
·170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
·180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
·190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
·200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
·210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
·220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
·230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
2
·240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
·250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
·260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
·270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
·280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
07
·290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
·300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
·310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
·320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
·330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
·340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
·350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
·360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
·370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
·380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
·390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
·400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
·410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
·420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
·430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
·440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
·450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
·460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1—SAVEs what you have entered so far.

f3—LOADs in a program worked on previously.

f5—To continue on a line you stopped on after LOADing in the previous saved work.

f7—Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. It temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                          OP
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";  FP
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                     JP
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"    FA
·120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.
 [3" "]"                                                AJ
·125 FORA=54272TO54296:POKEA,0:NEXT                     ND
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                             NP
·135 FORA=680TO699:READB:POKEA,B:NEXT                   FL
·140 DATA169,251,166,253,164,254,32,216,255,96          FF
·145 DATA169,0,166,251,164,252,32,213,255,96            EK
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B    KP
·155 GOSUB480:IFB=0THEN150                              OE
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16          AM
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B           PE
·170 GOSUB470:IFB=0THEN150                              PG
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16              GM
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1             HG
·185 POKE253,B:PRINT                                    EC
·190 REM  GET HEX LINE                                  ED
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8           KD
·200 FORB=0TO1:GOTO250                                  IH
·205 NEXTB                                              IJ
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340              FA
·215 PRINT" [c P][LEFT]";                               EG
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "              II
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255             GL
·230 NEXT                                               GI
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                     FL
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195      IM
·245 REM    GET HEX INPUT                               PA
·250 GETA$:IFA$=""THEN250                               GA
·255 IFA$=CHR$(20)THEN305                               GO
·260 IFA$=CHR$(133)THEN535                              LM
·265 IFA$=CHR$(134)THEN560                              IG
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                 HO
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                 HE
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295       MI
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295       DJ
·290 GOSUB415:GOTO250                                   JA
·295 PRINTA$"[c P][LEFT]";                              PK
·300 GOTO205                                            FA
·305 IFA>0THEN320                                       BI
·310 A=-1:IFB=1THEN330                                  BB
·315 GOTO220                                            FA
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1             BF
·325 A=A-1                                              FK
·330 PRINTCHR$(20);:GOTO220                             PH
·335 REM LAST LINE                                      CP
·340 PRINT" ":T=AD-(INT(AD/256)*256)                    KH
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255           OD
·350 NEXT                                               OB
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                     LH
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                    BO
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535             MB
·370 REM BELL AND ERROR MESSAGES                        LM
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415  JK
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415    PG
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                      IK
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                                HK
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415     DM
·400 PRINT"?ERROR IN SAVE":GOTO415                      JK
·405 PRINT"?ERROR IN LOAD":GOTO415                      IO
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT            JO
·415 POKE54276,17:POKE54276,16:RETURN                   BF
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN   DH
·425 REM GET FOUR DIGIT HEX                             IM
·430 PRINT:PRINTB$;:INPUTT$                             OL
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                   JD
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                            AK
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN  KB
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN        GM
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN        NJ
·460 T(A)=16:RETURN                                     IC
·465 REM ADDRESS CHECK                                  OL
·470 IFAD>ENTHEN385                                     HO
·475 IFB<SRORB>ENTHEN390                                LE
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395       OB
·485 RETURN                                             HE
·490 REM ADDRESS TO HEX                                 PM
·495 AC=AD:A=4096:GOSUB520                              AP
·500 A=256:GOSUB520                                     NF
·505 A=16:GOSUB520                                      LG
·510 A=1:GOSUB520                                       HE
·515 RETURN                                             JD
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530         OC
·525 A$=CHR$(T+48)                                      JI
·530 PRINTA$;:AC=AC-A*T:RETURN                          AA
·535 A$="**SAVE**":GOSUB585                             IC
·540 OPEN1,T,1,A$:SYS680:CLOSE1                         AB
·545 IFST=0THENEND                                      FB
·550 GOSUB400:IFT=8THENGOSUB420                         PM
·555 GOTO535                                            FI
·560 A$="**LOAD**":GOSUB585                             PE
·565 OPEN1,T,0,A$:SYS690:CLOSE1                         PO
·570 IFST=64THEN195                                     OI
·575 GOSUB405:IFT=8THENGOSUB420                         CO
·580 GOTO560                                            GN
·585 PRINT" ":PRINTTAB(14)A$                            KA
·590 PRINT:A$="":INPUT"FILENAME";A$                     IO
·595 IFA$=""THEN590                                     HK
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                   HL
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN       NP
·610 IFB$<>"T"THEN605                                   KO
·615 RETURN                                             PH
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B           DD
·625 GOSUB475:IFB=0THEN620                              NK
·630 PRINT:GOTO195                                      HN
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B           FK
·640 GOSUB475:IFB=0THEN635                              LN
·645 PRINT:GOTO670                                      HI
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                        LM
·655 PRINT" ";:NEXTB                                    LE
·660 PRINT:AD=AD+8                                      CD
·665 GETB$:IFB$=CHR$(136)THEN195                        JD
·670 GOSUB495:PRINT": ";:GOTO650                        KE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 79 and 80 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

SOUND ENLIGHTENMENT
FROM PAGE 32

LOOKING AT SOUND

```
1 REM==================================== NM
2 REM    >> LOOKING AT SOUND <<            MP
3 REM       RUPERT REPORT #50              OD
4 REM                                      JF
5 REM  A BRIEF TUTORIAL ON SOUND WAVES     MG
6 REM                                      JH
7 REM          FOR C-128 ONLY              LI
8 REM==================================== NB
10 GOSUB 5000 :REM INITIALIZE              AN
20 GOTO 6000  :REM KEYBOARD INPUT          GG
100 REM ==== GRAPH CONVERSIONS ====        GI
110 XS=A*X+B         :REM SCALE FACTORS    NL
120 YS=C*Y+D                               AF
130 IF XS>VR THEN XS=VR : REM LIMITING     OP
140 IF XS<VN THEN XS=VN                    NK
150 IF YS>VT THEN YS=VT                    PC
160 IF YS<VB THEN YS=VB                    KG
170 YS=200-YS  :REM INVERT Y-AXIS          BG
180 RETURN                                 EC
200 REM === DRAW GRAPH/MAKE SOUND ===      CF
210 VOL VL                                 EM
220 SOUND 1,FQ*16.4,DUR,,,,WV,PW           LF
230 X=0 : K1=VL/15 : K2=FQ/122             HF
240 DO WHILE X<WR                          JO
250 Y=K1*SIN(X*K2)                         LP
260 GOSUB 100        :REM CONVERT (X,Y)    BN
270 DRAW 1,XS,YS  :REM PLOT                PO
280 X=X+SS           :REM INCREMENT X      JP
290 LOOP                                   AP
300 VOL 0                                  DC
310 RETURN                                 MF
1000 REM === VOLUME ==================== AL
1010 SCNCLR : GOSUB 5150 :REM DRAW AXIS    JH
1020 CHAR 1,7,1,"-- VOLUME = AMPLITUDE -
-"                                         BC
1030 W$="SPEAKER MOVEMENT"                 AJ
1040 FOR YY=1 TO LEN(W$) : CHAR 1,4,YY+2
,MID$(W$,YY,1) : NEXT                      BH
1050 CHAR 1,6,7,"+" : CHAR 1,6,15,"-"      JF
1060 PRINT B$: PRINT "VOLUME 1 (SMALL AM
PLITUDE)"                                  HE
1070 GETKEY K$                             DE
1080 VL=1 : FQ=122 : DUR=800 : SS=.2 : G
OSUB 200                                   IL
1090 PRINT B$: PRINT "VOLUME 5 (MED. AMP
LITUDE)"                                   IO
1100 GETKEY K$                             FG
1110 VL=5 : GOSUB 200                      CK
1120 PRINT B$: PRINT "VOLUME 15 (LARGE A
MPLITUDE)"                                 PL
1130 GETKEY K$                             HI
1140 VL=15 : GOSUB 200                     JJ
1150 RETURN                                BA
2000 REM === FREQUENCY ================= OA
2010 SCNCLR : GOSUB 5150 :REM DRAW AXIS    HD
2020 CHAR 1,7,1,"-- FREQUENCY = PITCH --
"                                          LO
2030 CHAR 1,7,21,"<-=-=-=  25 MSEC  =-=-
=->"                                       IE
2040 PRINT B$:PRINT "FREQUENCY=40 HZ (LO
W PITCH)"                                  KD
2050 GETKEY K$                             AM
2060 FQ=40 : VL=8 : DUR=600 : SS=.3        CG
2070 GOSUB 200                             EE
2080 CHAR 1,11,5,"40 HZ"                   LD
2090 PRINT B$:PRINT "FREQUENCY=120 HZ (H
IGHER PITCH)"                              MI
2100 GETKEY K$                             EK
2110 FQ=120 : SS=.3 : DUR=800              ID
2120 GOSUB 200                             GK
2130 CHAR 1,10,14,"120 HZ"                 DI
2140 RETURN                                PC
3000 REM === QUALITY =================     JG
3010 SCNCLR : GOSUB 5150 :REM DRAW AXIS    GP
3020 CHAR 1,7,1,"-- QUALITY = WAVEFORM -
-"                                         PJ
3030 VL=8:DUR=0:FQ=40:SS=.5 : GOSUB 200    KG
3040 RESTORE                               HH
3050 PRINT B$:PRINT "TRIANGLE WAVE"        ID
3060 GETKEY K$ : PRINT CS$ : PRINT         HH
3070 VOL 15 : SOUND 1,2000,180,,,,0        BN
3080 GOSUB 3210 : SLEEP 2                  NE
3090 PRINT B$:PRINT "SAWTOOTH WAVE"        PH
3100 GETKEY K$ : PRINT CS$ : PRINT         HK
3110 SOUND 1,2000,180,,,,1                 KO
3120 GOSUB 3210 : SLEEP 2                  PM
3130 PRINT B$:PRINT "SQUARE WAVE"          FI
3140 GETKEY K$ : PRINT CS$ : PRINT         MC
3150 SOUND 1,2000,180,,,,2,2048            KE
3160 GOSUB 3210 : SLEEP 2                  CE
3170 RETURN                                PM
3180 DATA 3,4.71,.8,14.1,-.8,18.8,0        JO
3190 DATA 3,9,.8,9.6,-.8,18.8,0            BM
3200 DATA 5,0,.8,9.42,.8,9.42,-.8,18.8,-
.8,18.8,0                                  CJ
3210 X=0 : Y=0 : GOSUB 100 :DRAW 1,XS,YS   PA
3220 READ N : FOR J=1 TO N                 FB
3230 READ X,Y : GOSUB 100 :DRAW TO XS,YS   MI
3240 NEXT J                                HI
3250 RETURN                                EM
3260 DATA 3,1.57,.8,4.71,-.8,6.28,0        NI
3270 DATA 3,3,.8,3.2,-.8,6.28,0            GB
3280 DATA 5,0,.8,3.14,.8,3.14,-.8,6.28,-
.8,6.28,0                                  GH
4000 REM === PULSE WIDTH =============== GF
4010 SCNCLR : GOSUB 5150 :REM DRAW AXIS    IL
```

```
•4020 CHAR 1,6,1,"- SQUARE WAVE PULSE WID
 TH -"                                      PN
•4030 VL=10: DUR=0 :FQ=82 : SS=.5 : GOSUB
  200                                       HL
•4040 PRINT B$:PRINT "INCREASING PULSE WI
 DTHS"                                      JG
•4050 GETKEY K$                             PB
•4060 PRINT CS$ : PRINT                     CP
•4070 X=0 : Y=0 :GOSUB 100 : X0=XS+2 : Y0
 =YS                                        GO
•4080 X=3*PI : Y=.8 : GOSUB 100 : X2=XS :
  Y1=YS                                     OC
•4090 X=6*PI : Y=-.8 : GOSUB 100 : X4=XS-
 2 : Y2=YS                                  CO
•4100 X1=X0+1 : DX=(X4-X0)/16 : D2=DX*8     FE
•4110 VOL 10                                FL
•4120 FOR PW=550 TO 4050 STEP 500           GO
•4130 DRAW 0,X0,Y0 TO X0,Y1 TO X1,Y1 TO X
 1,Y2 TO X2,Y2 TO X2,Y1 TO X3,Y1 TO X3,Y2
  TO X4,Y2 TO X4,Y0                         KN
•4140 X1=X1+DX-1 : X3=X1+D2+1               PN
•4150 DRAW 1,X0,Y0 TO X0,Y1 TO X1,Y1 TO X
 1,Y2 TO X2,Y2 TO X2,Y1 TO X3,Y1 TO X3,Y2
  TO X4,Y2 TO X4,Y0                         NM
•4160 CHAR 1,1,14,"PW ="+STR$(PW)           GE
•4170 SOUND 1,6400,120,,,,2,PW              CG
•4180 SLEEP 2                               KA
•4190 NEXT                                  PA
•4200 RETURN                                AG
•5000 REM====== INITIALIZATION ========== HD
•5010 GR=RGR(1) : IF GR>5 THEN GR=5         KH
•5020 GRAPHIC 0,1 : GRAPHIC 2,1,23          EP
•5030 PRINT CHR$(27)"M" :REM NO SCROLL      KK
•5040 WINDOW 0,23,39,24 :REM PRINT WINDOW   OE
•5050 PI=3.14159265                         AI
•5060 REM --- GRAPH CONSTANTS ---           CN
•5070 WL=0 : WR=6*PI : WT=1 : WB=-1 : REM
   WORLD COORDS.                            LM
•5080 VN=60 : VR=252 : VT=180 : VB=40:REM
  VIEWPORT COORDS.                          MO
•5090 A=(VR-VN)/(WR-WL) : B=VN-A*WL         EJ
•5100 C=(VT-VB)/(WT-WB) : D=VB-C*WB         EB
•5110 X=0 : Y=0 : XS=0 : YS=0 : SS=.2       GO
•5120 CS$=CHR$(27)+"@"  :REM CLEAR TO EOS   BD
•5130 B$=CS$+"PRESS ANY KEY FOR"            CP
•5140 RETURN                                LG
•5150 REM -- DRAW VIEWPORT --               AN
•5160 BOX 1,VN,200-VT,VR,200-VB             EI
•5170 REM --- DRAW X AXIS ----              PP
•5180 Y=0 : GOSUB 100 : REM SCALE & LIMIT   LF
•5190 DRAW 1,VN,YS TO VR,YS                 FE
•5200 RETURN                                PC
•5210 REM================================  KD
•5330 GRAPHIC GR,1                          LC
•6000 REM===== KEYBOARD INPUT ==========   NI
•6010 CHAR 1,1,1,">> LOOKING AT SOUND <<"   IE
•6020 VOL 15 : FOR PW=0 TO 4095 STEP 250
 : SOUND 1,2000,10,,,,2,PW :NEXT            PO
•6030 VL=10 : FQ=1000 : DUR=1000 : WV=2 :
  PW=2048                                   DD
•6040 PRINT CS$;"LOOK AT >> VOLUME, FREQU
 ENCY, QUALITY,"                            MC
•6050 PRINT " OR PULSE-WIDTH [V,F,Q,P (X
 TO EXIT)] :"                               PO
•6060 GETKEY R$                             NA
•6070 N=INSTR("VFQPX",R$)                   FM
•6080 ON N GOSUB 1000,2000,3000,4000,6100   PH
•6090 GOTO 6030                             DN
•6100 REM ---- END ---                      KB
•6110 PRINT CHR$(27)"L":REM ENABLE SCROLL   KH
•6120 PRINT"[HOME][HOME]"        :REM NORM
 AL WINDOW                                  IJ
•6130 GRAPHIC GR,1     :REM ORIGINAL MODE   GP
```

ENVELOPE AND FILTER SAMPLER

```
•1 REM==================================== NM
•2 REM   ENVELOPE AND FILTER SAMPLER        MI
•3 REM        RUPERT REPORT #50             OD
•4 REM                                      JF
•5 REM             C-128                    JH
•6 REM==================================== CL
•10 TEMPO 40 : VOL 15                       AH
•20 PRINT"ENVELOPE #"                       HE
•30 FOR N=0 TO 9:PRINT N;: ENVELOPE N: PL
 AY"V1 O4 X0 T"+STR$(N)+"CDEFGFED" : NEXT   GK
•40 N$="V1 X1 O0 C O1 DC O2 C O4 CDE O5 C
  O6 C" : R$=CHR$(13)                       DI
•50 PRINT R$;R$; "ENVELOPE 0  -  PIANO"     DD
•60 PRINT "LOW PASS FILTER CUTOFF VALUE";
 R$;"  <INCREASING TREBLE>"                 DJ
•70 FOR F=0 TO 2047 STEP 200: PRINT F; :
 FILTER F,1,0,0,1 : PLAY "T0"+N$ : NEXT     IM
•80 PRINT R$;"HIGH PASS FILTER CUTOFF VAL
 UE";R$;"  <DECREASING BASS>"               GA
•90 FOR F=0 TO 2047 STEP 200: PRINT F; :
 FILTER F,0,0,1,1 : PLAY "T0"+N$ : NEXT     NA
•100 PRINT R$;R$;"ENVELOPE 3  -  DRUMS"     BI
•110 PRINT "LOW PASS FILTER CUTOFF VALUE"
 ;R$;"  <INCREASING TREBLE>"                CD
•120 FOR F=0 TO 2047 STEP 200: PRINT F; :
  FILTER F,1,0,0,1 : PLAY "T3"+N$ : NEXT    EJ
•130 PRINT R$;"HIGH PASS FILTER CUTOFF VA
 LUE";R$;"  <DECREASING BASS>"              HG
•140 FOR F=0 TO 2047 STEP 200: PRINT F; :
  FILTER F,0,0,1,1 : PLAY "T3"+N$ : NEXT    AN
```

PROGRAMS NEEDED!

We always have room for one more top-flight game, utility, or productivity program. Send your best work on disk, accompanied by printed documentation and a self-addressed, stamped envelope to:

Ahoy! Program Submissions Dept.
Ion International Inc.
45 West 34th Street—Suite 500
New York, NY 10001

ML RANGER

FROM PAGE 49

Starting address in hex: C000
Ending address in hex: C3E7
SYS to start: 49152

Flankspeed **required for entry! See page 81.**

```
C000: A9 0C 8D 21 D0 A9 0E 8D 7A
C008: 20 D0 A9 93 20 D2 FF 20 49
C010: 24 C0 20 AF C0 20 2E C1 95
C018: 20 AF C0 20 3D C1 20 AF 97
C020: C0 4C 5A C2 A2 00 BD 4E F8
C028: C0 20 D2 FF E8 E0 32 D0 A8
C030: F5 60 A2 00 BD 80 C0 20 48
C038: D2 FF E8 E0 15 D0 F5 60 11
C040: A2 00 BD 95 C0 20 D2 FF E9
C048: E8 E0 18 D0 F5 60 90 0D EE
C050: 0D 0D 4D 4C 20 52 41 4E 06
C058: 47 45 52 0D 0D 42 59 20 0D
C060: 4A 4F 48 4E 20 46 45 44 80
C068: 4F 52 0D 0D 0D 0D 53 54 E5
C070: 41 52 54 49 4E 47 20 41 98
C078: 44 44 52 45 53 53 3A 20 99
C080: 0D 0D 45 4E 44 49 4E 47 51
C088: 20 41 44 44 52 45 53 53 B0
C090: 20 2B 31 3A 20 0D 0D 4E CF
C098: 45 57 20 53 54 41 52 54 E4
C0A0: 49 4E 47 20 41 44 44 52 BB
C0A8: 45 53 53 3A 20 00 00 A9 98
C0B0: 00 85 C6 A0 00 98 48 20 9E
C0B8: E4 FF F0 FB AA 68 A8 8A D0
C0C0: C9 0D F0 2D C9 14 F0 1E A2
C0C8: C9 30 90 E9 C9 47 B0 E5 E4
C0D0: C9 3A 90 04 C9 41 90 DD E2
C0D8: C0 04 F0 D9 20 D2 FF 99 F4
C0E0: 3C 03 C8 4C B5 C0 C0 00 6C
C0E8: F0 CB 20 D2 FF 88 4C B5 23
C0F0: C0 C0 04 D0 C0 A2 00 BD 68
C0F8: 3C 03 38 E9 30 C9 0A 90 EE
C100: 03 38 E9 07 9D 3C 03 E8 F1
C108: E0 04 D0 EB A0 00 B9 3C 40
C110: 03 A2 0F 18 79 3C 03 CA 60
C118: D0 F9 18 C8 79 3C 03 C8 45
C120: C0 04 F0 06 8D 3D 03 4C F5
C128: 0E C1 8D 3C 03 60 AD 3C 0F
C130: 03 8D 40 03 AD 3D 03 8D 7F
C138: 41 03 4C 32 C0 AD 3C 03 A8
C140: 8D 42 03 AD 3D 03 8D 43 D1
C148: 03 4C 40 C0 AD 3D 03 8D 14
C150: 45 03 AD 3C 03 8D 44 03 5A
C158: 60 01 02 01 01 01 02 02 C2
C160: 01 01 02 02 01 01 04 04 70
C168: 01 02 02 01 01 01 02 02 74
C170: 01 01 04 01 01 01 04 04 81
C178: 01 04 02 01 01 02 02 02 87
C180: 01 01 02 01 01 04 04 04 92
C188: 01 01 02 01 01 01 02 02 93
C190: 01 01 04 01 01 01 04 04 A1
C198: 01 01 02 01 01 01 02 02 A3
C1A0: 01 01 02 01 01 04 04 04 B2
C1A8: 01 02 02 01 01 01 02 02 B4
C1B0: 01 01 04 01 01 01 04 04 C1
C1B8: 01 01 02 01 01 01 02 02 C3
C1C0: 01 01 02 01 01 04 04 04 D2
C1C8: 01 02 02 01 01 01 02 02 D4
C1D0: 01 01 04 01 01 01 04 04 E1
C1D8: 01 01 02 01 01 02 02 02 E4
C1E0: 01 01 01 01 01 04 04 04 F1
C1E8: 01 02 02 01 01 02 02 02 F5
C1F0: 01 01 04 01 01 01 04 01 FE
C1F8: 01 02 02 02 01 02 02 02 07
C200: 01 01 02 01 01 04 04 04 12
C208: 01 02 02 01 01 02 02 02 15
C210: 01 01 04 01 01 04 04 04 24
C218: 01 02 02 01 01 02 02 02 25
C220: 01 01 02 01 01 04 04 04 32
C228: 01 02 02 01 01 01 02 02 34
C230: 01 01 04 01 01 01 04 04 41
C238: 01 02 02 01 01 02 02 02 45
C240: 01 01 02 01 01 04 04 04 52
C248: 01 02 02 01 01 01 02 02 54
C250: 01 01 04 01 01 01 04 04 61
C258: 01 00 20 4C C1 20 A7 C2 12
C260: AD 45 03 CD 41 03 90 24 1D
C268: F0 02 B0 08 AD 44 03 CD D6
C270: 40 03 90 18 A2 01 38 AD E5
C278: 44 03 ED 40 03 8D 47 03 C8
C280: AD 45 03 ED 41 03 8D 48 7E
C288: 03 4C A1 C2 38 AD 40 03 65
C290: ED 44 03 8D 47 03 AD 41 8C
C298: 03 ED 45 03 8D 48 03 A2 4D
C2A0: 00 8E 46 03 4C C1 C2 AD F6
C2A8: 43 03 CD 41 03 F0 04 B0 A6
C2B0: 0A 90 09 AD 42 03 CD 40 55
C2B8: 03 90 01 60 68 68 4C 00 CA
C2C0: C0 AD 40 03 85 FB AD 41 E2
C2C8: 03 85 FC AD 44 03 85 FD C6
C2D0: AD 45 03 85 FE A0 00 B1 9D
C2D8: FB AA BD 59 C1 AA E0 04 E7
C2E0: F0 0F 86 02 A0 00 B1 FB B7
C2E8: 91 FD C8 CA D0 F8 4C 74 96
C2F0: C3 A0 01 B1 FB 8D 3C 03 D0
C2F8: C8 B1 FB 8D 3D 03 AD 3D 28
C300: 03 CD 41 03 F0 04 B0 0A C4
C308: 90 38 AD 3C 03 CD 40 03 CE
C310: 90 30 AD 3D 03 CD 43 03 D2
C318: 90 0C F0 02 B0 24 AD 3C 66
C320: 03 CD 42 03 B0 1C 20 47 6A
C328: C3 A0 00 B1 FB 91 FD C8 92
C330: AD 3C 03 91 FD C8 AD 3D 60
C338: 03 91 FD A2 03 86 02 4C 45
C340: EE C2 A2 03 4C E2 C2 AE 38
C348: 46 03 D0 14 38 AD 3C 03 9B
```

```
C350: ED 47 03 8D 3C 03 AD 3D 40
C358: 03 ED 48 03 8D 3D 03 60 C2
C360: 18 AD 3C 03 6D 47 03 8D AA
C368: 3C 03 AD 3D 03 6D 48 03 4E
C370: 8D 3D 03 60 18 A5 FB 65 BD
C378: 02 85 FB A5 FC 69 00 85 8D
C380: FC 18 A5 FD 65 02 85 FD 24
C388: A5 FE 69 00 85 FE A5 FC BD
C390: CD 43 03 90 0B F0 02 B0 E3
C398: 0A A5 FB CD 42 03 B0 03 0B
C3A0: 4C D5 C2 A2 00 BD B1 C3 5B
C3A8: 20 D2 FF E8 E0 30 D0 F5 5C
C3B0: 60 93 0D 0D 0D 54 52 41 B3
C3B8: 4E 53 46 45 52 20 43 4F EA
C3C0: 4D 50 4C 45 54 45 44 2E FB
C3C8: 0D 0D 44 4F 4E 27 54 20 60
C3D0: 46 4F 52 47 45 54 20 54 0E
C3D8: 4F 20 53 41 56 45 2E 0D B3
C3E0: 0D 00 FF 00 FF 00 FF 00 ED
```

COFFEE BREAK

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```
·10 REM **********************          FG
·20 REM ** COFFEE BREAK 128 **          LE
·30 REM ** BY  DAN KOMAROMI **          AI
·40 REM ** USE JOYSTICK  #2 **          ML
·50 REM ** (C) COPYRIGHT'87 **          GD
·60 REM **********************          HI
·70 RESTORE1100:FORI=3584TO3776:READD$:PO
 KEI,DEC(D$):NEXT:RESTORE               NJ
·80 FAST:CLR:COLOR4,12:COLOR0,15:GRAPHIC1
 ,1:DIMW$(24)                           HK
·90 COLOR1,2:CHAR,8,2,"C O F F E E  B R E
  A K !":CHAR,13,4,"BY DAN KOMAROMI":CHAR
 ,8,10,"PLEASE WAIT":CHAR,8,12,"GRINDING
 THE BEANS[3"."]"                       OC
·100 COLOR1,8:BOX,60,76,236,106:SLOW:GOSU
 B690                                   HB
·110 COLOR1,15:CIRCLE,150,150,4,3:PAINT,1
 50,150:SSHAPE A$,146,147,154,153       KN
·120 FAST:COLOR4,15:COLOR0,1:GRAPHIC1,1 MK
·130 COLOR1,4:DRAW,10,5TO60,5TO50,50TO100
 ,50TO100,70TO95,70TO95,55TO20,55TO20,50T
 O10,5:PAINT,12,10:COLOR1,2:CHAR,2,2,"MIL
 K"                                     JJ
·140 COLOR1,8:DRAW,70,5TO112,5TO112,70TO1
 07,70TO107,40TO70,40TO70,5:PAINT,71,6:CO
 LOR1,2:CHAR,9,2,"SUGAR"                KA
·150 COLOR1,11:DRAW,120,5TO170,5TO170,30T
 O125,30TO125,70TO120,70TO120,5:PAINT,121
 ,6:COLOR1,2:CHAR,16,2,"CREAM"          PH
·160 COLOR1,5:DRAW,180,5TO230,5TO225,25TO
 220,39TO138,39TO138,70TO133,70TO133,35TO
 180,35TO180,5:PAINT,181,6:COLOR1,2:CHAR,
 23,2,"NON":CHAR,23,3,"DAIRY"           BJ
·170 COLOR1,9:DRAW,240,5TO310,5TO305,20TO
 245,20TO245,51TO150,51TO150,70TO145,70TO
 145,46TO240,46TO240,5:PAINT,241,6:COLOR1
 ,2:CHAR,31,1,"COFFEE"                  CM
·180 COLOR1,10:DRAW,255,25TO305,25TO305,6
 1TO163,61TO163,70TO158,70TO158,56TO255,5
 6TO255,25:PAINT,256,26:COLOR1,2:CHAR,33,
 4,"DECAF"                              PN
·190 COLOR1,12:DRAW,15,85TO310,85:DRAW,10
 ,90TO305,90:FORI=15TO310STEP5:DRAW,I,85T
 OI-5,90:NEXT                           AC
·200 FORI=16TO310STEP10:PAINT,I,87:NEXT OC
·210 COLOR1,2:CHAR,3,13,"RV  STP  FW":CHA
 R,2,17,"CONTROL PANEL":COLOR1,14:BOX,19,
 96,117,128                             LL
·220 COLOR1,4:GSHAPEA$,27,114:COLOR1,8:GS
 HAPEA$,63,114:COLOR1,4:GSHAPEA$,100,114 EK
·230 COLOR1,14:BOX,186,96,310,175:COLOR1,
 2:CHAR,23,23,"CUSTOMER REQUEST"        FA
·240 COLOR1,14:BOX,122,96,175,157:COLOR1,
 4:CHAR,16,13,"[c P][c P]",1:COLOR1,8:CHA
 R,16,14,"[c P][c P]",1                 AP
·250 COLOR1,11:CHAR,16,15,"[c P][c P]",1:
 COLOR1,5:CHAR,16,16,"[c P][c P]",1:COLOR
 1,9:CHAR,16,17,"[c P][c P]",1:COLOR1,10:
 CHAR,16,18,"[c P][c P]",1              DL
·260 COLOR1,15:FORI=0TO21:CHAR,I,20," ",1
 :NEXT:FORI=21TO24:CHAR,21,I," ",1:NEXT:C
 OLOR1,2:CHAR,18,13,"[BACKARROW]":SLOW:V=
 1                                      NK
·270 CUS=2:MI=2                         HC
·280 D=D+1:CHAR,0,22,"DAY:"+STR$(D):CHAR,
 0,24,"CUSTOMERS:":IFRT=5THENRETURN     KM
·290 COLOR1,8:CHAR,11,24,"[s Q][s Q]"   MF
·300 COLOR1,2:CHAR,0,23,"SCORE:"+STR$(SCR
 ):IF RT=5THENRETURN                    CP
·310 CHAR,0,21,"TIME LEFT: --":CLK=60   KI
·320 FOR I=1TO3:MOVSPRI,0,0:NEXT:FORI=1TO
 3:SPRITEI,1,2:NEXT:MOVSPR1,40,120:SOUND2
 ,1500,32767,2,100,1000,0,100           IC
·330 CHAR,24,13,"IT'S 7:00 A.M.":CHAR,24,
 14,"AND THE COFFEE":CHAR,24,15,"RUSH IS
 HERE!":IFSKP=5THENRETURN:ELSEGOTO350   FB
·340 CHAR,24,18,"PRESS BUTTON":CHAR,24,19
 ,"TO START DAY"+STR$(D):RETURN         CM
·350 DOUNTILJOY(2)>127:COLOR1,2:FOR GENNE
 SS=1TO250:NEXT:SOUND1,2500,1:GOSUB340:CO
 LOR1,12:FORI=1TO250:NEXT:SOUND1,5000,1:G
 OSUB340:LOOP                           MG
·360 REM *** MAIN ROUTINE ***           DF
·370 SKP=5:GOSUB330                     KN
·380 N=1:GOSUB860:TI$="[5"0"]1"         JP
·390 J=JOY(2):K$=" "+RIGHT$(STR$(CLK-1-VA
 L(TI$)),2):CHAR,10,21,(K$):IFVAL(K$)<1TH
 EN730                                  ML
·400 IFJ=3ANDZZ<>1THENGOSUB500:ELSEIFJ=7A
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 79 and 80 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
NDZZ<>2THENGOSUB540                         BK
•410 IFJ=1ORJ=5THENGOSUB440:ELSEIFRSPPOS(
1,0)>300THEN970                             HN
•420 IFJ=128ANDZZ=5THEN580:ELSEIFRSPPOS(1
,0)<40ANDZZ<>1THENMOVSPR1,0#0               CG
•430 COLOR1,2:GOTO390                       IO
•440 SOUND 1,60000,1,0,400,500,0:SOUND1,3
0000,1,0,400,100,3:IFJ=5THEN480             GO
•450 V=V-1:IFV<1THENV=6                     KH
•460 FORI=13TO18:COLOR1,1:CHAR,18,I,"X":N
EXT                                         JB
•470 COLOR1,2:CHAR,18,12+V,"[BACKARROW]":
RETURN                                      PL
•480 V=V+1:IFV>6THENV=1                     MC
•490 GOTO460                                AL
•500 IFZZ=2THENMOVSPR1,0#0:SOUND1,1500,2:
COLOR1,8:GSHAPEA$,63,114:COLOR1,4:GSHAPE
A$,100,114:GSHAPEA$,27,114:ZZ=5:RETURN      NG
•510 MOVSPR1,90#1:SOUND1,500,3:COLOR1,8     EO
•520 GSHAPEA$,100,114:COLOR1,4:GSHAPEA$,2
7,114:GSHAPEA$,63,114                       FJ
•530 ZZ=1:RETURN                            HL
•540 IFZZ=1THENMOVSPR1,0#0:SOUND1,1500,2:
COLOR1,8:GSHAPEA$,63,114:COLOR1,4:GSHAPE
A$,100,114:GSHAPEA$,27,114:ZZ=5:RETURN      NA
•550 MOVSPR1,270#1:SOUND1,500,3:COLOR1,8    KC
•560 GSHAPEA$,27,114:COLOR1,4:GSHAPEA$,10
0,114:GSHAPEA$,63,114                       PB
•570 ZZ=2:RETURN                            JM
•580 IFV=2THENY=3:ELSEY=2                   BE
•590 IFV=1ORV=2THENC=2:ELSEIFV=5THENC=9     LA
•600 IFV=3ORV=4THENC=8:ELSEIFV=6THENC=10    KC
•610 MOVSPRY,0,0:SPRITEY,1,C,1,0,0,0        JJ
•620 IFV=1THENX=119:ELSEIFV=2THENX=132      DL
•630 IFV=3THENX=144:ELSEIFV=4THENX=158      AL
•640 IFV=5THENX=170:ELSEIFV=6THENX=183      OA
•650 FORI=100TO120:MOVSPRY,X,I              HI
•660 IFI>105ANDBUMP(1)=3ORBUMP(1)=5THEN71
0                                           FJ
•670 FORU=1TO5:NEXT:NEXT                    JA
•680 SOUND3,10000,30,1,1000,150,2:GOTO720   ID
•690 PLAY"X0U12V1O6Q$EV2O5QGV3O4QCO3QCV2O
4QGV1O5Q$EH$EV2O4HGV3O3HCHFV2O4H$AV1O5HC
V1O5HFV2O4H$AV3O3W$DV2O5W$AV1O6WFV3O3W$A
V2O6W$DV1WFV3O3W$AV2O5H$ABO1A"              BM
•700 RETURN                                 EM
•710 SOUND1,20000,10,,,3:V(V)=V:RT=5:SCR=
SCR+5:GOSUB300                              OC
•720 SPRITEY,0:GOTO390                      AP
•730 FORI=1TO8:SPRITEI,0:NEXT:COLOR4,5:FO
RI=1TO3:SOUNDI,0,0:NEXT:SOUND1,8000,160,
2,50,70,0:GRAPHIC0,1:FORI=1TO200:COLOR0,
14:COLOR0,1:NEXT                            OH
•740 PRINT"[CLEAR][3"[DOWN]"][WHITE][12"
"]G A M E  O V E R[4" "]"                   IJ
```

```
•750 PRINT"[3"[DOWN]"][CYAN][RVSON]YOU RA
N OUT OF TIME.  THE CUSTOMERS LEFT";        EB
•760 PRINT"THE SHOP.[31" "]"                JD
•770 PRINT"[DOWN][YELLOW]YOUR FINAL STATU
S:"                                         KF
•780 PRINT"[DOWN]SCORE: [WHITE][RVSON]";S
CR                                          AN
•790 PRINT"[DOWN][YELLOW]DAY: [WHITE][RVS
ON]";D:FORI=1TO300:COLOR4,5:COLOR4,1:NEX
T:MOVSPR1,0#0                               AO
•800 PRINT"[DOWN][DOWN][c 6]PLAY AGAIN (Y
/N)?":DO:GETA$:LOOPUNTILA$="":GETKEYA$:I
FA$="N"THENCOLOR0,12:COLOR4,14:GRAPHIC0,
1:END                                       EK
•810 RUN80                                  BO
•820 END                                    LH
•830 RET=5:COLOR1,8:FORI=1TOCUS:CHAR,10+I
,24,"[s Q]":NEXT:SCR=SCR+100:GOSUB300:GO
SUB280:ZZ=2:CLK=CLK-3:GOSUB500:MOVSPR1,4
0,120:GS=5:GOSUB940:MI=2:GOTO350            NN
•840 MI=MI-1                                PM
•850 IFMI=0THEN830:ELSECOLOR1,12:CHAR,11+
MI,24,"[s Q]":SCR=SCR+50:RT=5:GOSUB300:M
OVSPR1,40,120:ZZ=2:SOUND1,58000,30,0,5,1
000,1:GOSUB500:GOSUB860:GOTO390             FD
•860 RESTORE:FORI=1TO23:READQ$:W$(I)=Q$:N
EXT                                         CM
•870 I=INT(RND(1)*6+1):C$(1)=W$(I):DK(1)=
I                                           FM
•880 A=INT(RND(1)*2+1):IFA=1THENI=INT(RND
(1)*2+1)+6:C$(2)=W$(I)+" COFFEE":DK(2)=I    OK
•890 IFA=2THENI=INT(RND(1)*6+1)+8:C$(2)=W
$(I)+" COFFEE":DK(2)=I                      NN
•900 I=INT(RND(1)*2+1)+14:C$(3)="WITH "+W
$(I):DK(3)=I:I=INT(RND(1)*3+1)              IH
•910 IFI=3THEN930:ELSEI=INT(RND(1)*2+1)+1
6                                           JM
•920 C$(4)="AND "+W$(I):DK(4)=I             NK
•930 I=INT(RND(1)*5+1)+18:C$(6)=W$(I)       JK
•940 COLOR1,1:FORIK=24TO37:FOROK=13TO19:C
HAR,IK,OK,"X":NEXT:NEXT:IFGS=5THENGS=0:R
ETURN                                       LP
•950 COLOR1,8:FORI=1TO4:CHAR,24,I+12,C$(I
):NEXT:CHAR,24,19,C$(6):COLOR1,2            AC
•960 RETURN                                 FB
•970 YT=0:IFV(6)=6ANDDK(2)>8THENYT=YT+1:E
LSEIFV(6)<>6ANDDK(2)<9THENYT=YT+1           CO
•980 IFV(5)=5ANDDK(2)<9THENYT=YT+1:ELSEIF
V(5)<>5ANDDK(2)>8THENYT=YT+1                JF
•990 IFV(1)=1ANDDK(3)<>15THENYT=YT+1:ELSE
IFV(1)<>1ANDDK(3)=15THENYT=YT+1             CD
•1000 IFV(2)=2ANDDK(3)<>16THENYT=YT+1:ELS
EIFV(2)<>2ANDDK(3)=16THENYT=YT+1            FJ
•1010 IFV(3)=3ANDDK(4)<>17THENYT=YT+1:ELS
EIFV(3)<>3ANDDK(4)=17THENYT=YT+1            OJ
```

```
•1020 IFV(4)=4ANDDK(4)<>18THENYT=YT+1:ELS
EIFV(4)<>4ANDDK(4)=18THENYT=YT+1 GD
•1030 FORI=1TO5:V(I)=0:NEXT:DK(0)=0:DK(1)
=0 IM
•1040 IFYT>0THENMOVSPR1,40,120:MOVSPR1,0#
0:C$(6)="DO IT RIGHT!":SOUND1,2500,30,2,
10,10,2:GOSUB950:ZZ=2:GOSUB500:FORI=1TO6
:V(I)=0:NEXT;GOTO390 OF
•1050 GOTO 840 EC
•1060 DATA I NEED,GET ME,I WANT,PLEASE GE
T,HURRY WITH MY,HURRY MY JE
•1070 DATA DECAF.,NO CAF.,STRONG,BLACK,FI
NE,FRESH,GOOD,CUP OF PJ
•1080 DATA MILK,SUGAR,CREAM,NONDAIRY CK
•1090 DATA THANK YOU,PLEASE HURRY,THANKS,
GOOD LUCK!,BE QUICK JA
•1100 DATA 0,,,,,,,,,,,,,,,,,,,3E,,3,C1,E
0,4,,10,77,80,F0,CF,FF,F0,87,FF,F0,CF,FF
,F0,77 AF
•1110 DATA FF,F0,7,FF,F0,7,FF,F0,3F,FF,FE
,7B,FF,EF,3C,3E,1E,1F,C1,FC,3,FF,E0,,,,,
,,,,,,,,,,,,0 MA
•1120 DATA 0,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
20,,,20,,,70,,,F8,0 KE
•1130 DATA 0,F8,,,70,,,,,,,,,,,,,,,,,,,,,
,,,,,,,,,,,,,,0 NK
•1140 DATA 0,,,,,,,,,,,,,,80,,,10,,,A0,,,1
0,,,C0,,,50,,,EB,0 BH
```

CRYPT OF FEAR

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```
•10 POKE53280,.:POKE53281,.:GOTO860 JK
•20 HR=FNH(.):POKEFNPM(10),K:POKEFNSM(10)
,HR:RETURN BO
•30 M=INT(RND(F)*29):POKES+F,H(M):POKES,L
(M):POKES+G,H(M+H):POKES+7,L(M+H) CK
•40 POKES+15,H(M+H+G):POKES+14,L(M+H+G):R
ETURN AC
•50 REM WALLHANDLER PM
•60 VL=FC:ONFC+FGOSUB500,500,520,550,570 BG
•70 RETURN NE
•80 PRINT"[CLEAR][RVSOFF][5" "][s M][c @]
[s R][s F][s C][s D][s E][15"[c Y]"][s E
][s D][s C][s F][s R][c P][c @][s N]" JM
•90 PRINT"[5" "][c M]"SPC(28)"[c G]" KL
•100 PRINT"[5" "][s Y][3" "][22"[c @]"][3
" "][s T]" AI
•110 PRINT"[5" "][s H][3" "][s B][s M][18
"[c @]"][s N][s B][3" "][s G]" EL
•120 PRINT"[5" "][s B][3" "][s G][s B][18
"[c T]"][s H][s H][3" "][s B]" FE
•130 PRINT"[5" "][s G][3" "][s T][s T][s
M][c @][s R][s F][s C][s D][6"[s E]"][s
D][s C][s F][s R][c @][s N][s Y][s Y][3"
"][s H]" DN
•140 PRINT"[5" "][s T][3" "][c G][c G][s
Y]  [12"[c @]"] [c M] [c M][c M][3" "][s
Y]" IC
•150 PRINT"[5" "][c G]  [c M][c M] [s H]
 [s B][s M][8"[c @]"][s N][s B]  [c G] [
c G][c G]  [c M]" IF
•160 PRINT"[4" "][c M][3" "][s Y][s Y] [s
 B]  [s G][s B][s M][c @][s R][s F][s F]
[s R][c @][s N][s B][s H]  [s T] [s T][s
 T][3" "][c G]" OE
•170 PRINT"[4" "][s Y][3" "][s H][s H] [s
 G]  [s T][s T][c M] [4"[c @]"] [c G][s
Y][s Y]  [s G] [s G][s G][3" "][s T]" BJ
•180 PRINT"[4" "][s H][3" "][s B][s B] [s
 T]  [c G][c G][s Y][s Y][4"[s D]"][s T]
[s T][c M][c M]  [s B] [s B][s B][3" "][
s G]" JB
•190 PRINT"[4" "][s B][3" "][s G][s G] [c
 G] [c M][c M] [s H][s H][c D][c I][c I]
[c F][s G][s G] [c G][c G] [s H] [s H][s
 H][3" "][s B]" CG
•200 PRINT"[4" "][s G][3" "][s T][s T][c
M]  [s Y][s Y] [s B][s B][RVSON][c K][RV
SOFF]  [c K][s B][s B] [s T][s T] [s Y]
[s Y][s Y][3" "][s H]" HK
•210 PRINT"[4" "][s T][3" "][c G][c G][s
Y]  [s H][s H] [s G][s G][RVSON][c H][RV
SOFF]  [RVSON][c N][RVSOFF][s H][s H] [s
 G][s G] [c M] [c M][c M][3" "][s Y]" CL
•220 PRINT"[4" "][c G]  [c M][c M] [s H]
 [s B][s B] [s T][s T][RVSON][c M][RVSOF
F][c @][c @][RVSON][c G][RVSOFF][s Y][s
Y] [s B][s B]  [c G] [c G][c G]  [c M]" JP
•230 PRINT"[3" "][c M][3" "][s Y][s Y] [s
 B]  [s G][s G] [s L][c G][4"[s R]"][c M
][s @] [s H][s H]  [s T] [s T][s T][3" "
][c G]" EC
•240 PRINT"[3" "][s Y][3" "][s H][s H] [s
 G]  [s T][s T][s N][8"[c T]"][s M][s Y]
[s Y]  [s G] [s G][s G][3" "][s T]" PG
•250 PRINT"[3" "][s H][SS]  [s B][s B] [s
 T]  [c G][c G]"SPC(10)"[c M][c M]  [s B
] [s B][s B][3" "][s G]" EL
•260 PRINT"[3" "][s B][3" "][s G][s G] [c
 G] [c M][s N][12"[c T]"][s M][c G] [s H
] [s H][s H][3" "][s B]" DB
•270 PRINT"[3" "][s G][3" "][s T][s T][s
N][20"[c T]"][s M][s Y][s Y][3" "][s H]" EP
•280 PRINT"[3" "][s T][3" "][c G][c G]"SP
C(22)"[c M][c M][3" "][s Y]" ML
•290 PRINT"[3" "][s L][c P][c P][s @][s N
][24"[c T]"][s M][s L][c P][c P][s @]" DK
•300 PRINT"  [s N][4" "][26"[c T]"][4" "]
[s M]":PRINT" [s N]"SPC(36)"[s M]" JB
•310 PRINT"[RVSON][c 4][3" "]";D$(CD);"[6
" "]# $ % & ) ( ' * + G [s S][5" "]";D$(
CD);"  [RVSOFF]";L$(DD); PI
•320 RETURN MP
•330 REM 1ST LEFT BLOCK GI
•340 PRINT"[HOME][DOWN][5"[c Y]"][s P]":P
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RINT"[19"[DOWN]"][3"[c P]"]":RETURN        BL
•350 REM 2ND LEFT BLOCK                       EO
•360 PRINT"[HOME][6"[DOWN]"]";TAB(10)"[s
 O][s P]":PRINT"[11"[DOWN]"]"TAB(9)"[c P]
 ":RETURN                                    AG
•370 REM 3RD LEFT BLOCK                       GJ
•380 PRINT"[HOME][9"[DOWN]"]";TAB(15)"[s
 O][s P]":PRINT"[5"[DOWN]"]"TAB(15)"[c @]
 ":RETURN                                    BN
•390 REM 4TH LEFT BLOCK                       JG
•400 PRINT"[HOME][11"[DOWN]"]";TAB(18)"[c
  E]":PRINT"[DOWN][DOWN]"TAB(17)"[s L]":R
 ETURN                                       OM
•410 REM 1ST RIGHT BLOCK                      PB
•420 PRINT"[HOME][DOWN]"TAB(34)"[s O][4"[
 c Y]"]":PRINT"[19"[DOWN]"]"TAB(37)"[c P]
 [c P]":RETURN                               GO
•430 REM 2ND RIGHT BLOCK                      PP
•440 PRINT"[HOME][6"[DOWN]"]";TAB(28)"[c
 Y][s P]":PRINT"[11"[DOWN]"]"TAB(30)"[c P
 ]":RETURN                                   AK
•450 REM 3RD RIGHT BLOCK                      OC
•460 PRINT"[HOME][9"[DOWN]"]";TAB(23)"[s
 O][s P]":PRINT"[5"[DOWN]"]"TAB(24)"[c @]
 ":RETURN                                    LC
•470 REM 4TH RIGHT BLOCK                      CH
•480 PRINT"[HOME][11"[DOWN]"]";TAB(21)"[c
  R]":PRINT"[DOWN][DOWN]"TAB(22)"[s @]":R
 ETURN                                       LF
•490 REM 1ST WALL                             JF
•500 PRINT"[HOME][DOWN][DOWN]";:FORX=.TO1
 9:PRINTTAB(6)LEFT$(L$,28):NEXT:RETURN       HI
•510 REM 2ND WALL                             JH
•520 PRINT"[HOME][5"[DOWN]"]";:FORX=.TO12
 :PRINTCHR$(13)TAB(12)LEFT$(L$,15);:NEXT     EJ
•530 PRINT"[RVSOFF] ":RETURN                  HE
•540 REM 3RD WALL                             JB
•550 PRINT"[HOME][9"[DOWN]"]";:FORX=.TO6:
 PRINTTAB(17);LEFT$(L$,6):NEXT:RETURN        DD
•560 REM 4TH WALL                             NE
•570 PRIT"[HOME][11"[DOWN]"]";:PRINTTAB(1
 8)"[c D][s C][s C][c F]"                    LK
•580 FORX=.TOF:PRINTTAB(18)"[s T]  [s Y]"
 :NEXT:PRINTTAB(18)"[s L][c @][c @][s @]"
 :RETURN                                     NM
•590 REM LOOK ROUTINE                         ED
•600 CEM=FNTE(.):POKEED,CEM:PRINTL$(DD);:
 GOSUB80                                     IE
•610 FC=H:VL=FC:LV=CD-F+H*-(CD=F):RV=CD+F
 +H*(CD=H)                                   AG
•620 EBM=FNCP(.):IFEBM>-FANDEBM<256THEN65
 0                                           CB
•630 IFFCTHENFC=FC-F:GOTO620                  BO
•640 RETURN                                   BA
•650 EL=FNCP(LV):ER=FNCP(RV)                  KC
•660 IF(DL(EBM,.))THEN680                     KP
•670 GOSUB60:FC=FC-F:ONF-(FC<.)GOTO620,74
 0                                           AN
•680 IFDL(EL,.)ANDFC<HTHENONFC+FGOSUB340,
 360,380,400                                 KC
•690 IFDL(ER,.)ANDFC<HTHENONFC+FGOSUB420,
 440,460,480                                 MP
•700 FC=FC-F:IFFC>-FTHEN620                   JA
•710 IFDL(CL,K)=.THEN740                      EF
•720 FORX=.TOG:POKEPL,21:PRINT:IF(DL(CL,K
 )ANDBO(X))THENPRINTTAB(X*H+3);OA$(X)        MI
•730 NEXT                                     FO
•740 GOSUB780:IFCL=WLANDCD=HTHENPOKEPL,7:
 PRINT:PRINTTAB(18)"[s M][s N][DOWN][LEFT
 ][LEFT][s N][s M]"                          JF
•750 POKEFNPM(U),15                           PP
•760 CSM=FNSW(.):POKEV+24,(PEEK(V+24)AND1
 5)ORCSM:RETURN                              NF
•770 REM MONSTER DISPLAY                      KN
•780 IFFCANDVLTHENVL=VL-F                     AC
•790 D=54:POKEFNMP(F),D:POKEFNMP(K),D:POK
 EFNMP(3),D:POKEFNMP(5),D                    GG
•800 EL=.:FORX=VLTO.STEP-F:FC=FNCM(X):IFD
 L(FC,F)=.THEN840                            BA
•810 FC=DL(FC,F)-F:EL=(ELORSP(X+H))           LA
•820 MB=SP(X)-F:FORD=FTOLEN(SB$(X,FC)):PO
 KEFNMP(MB+D),ASC(MID$(SB$(X,FC),D,F))       DC
•830 POKEBC+SP(X)+D,CS(FC):NEXT               JE
•840 NEXT:POKEV+21,EL:RETURN                  KL
•850 REM SET UP VIC                           GD
•860 POKE56578,PEEK(56578)OR3:POKE56576,(
 PEEK(56576)AND252)                          EI
•870 POKE53272,PEEK(53272)AND15:POKE648,1
 92:POKE53272,(PEEK(53272)AND240)OR12        CF
•880 POKE53270,(PEEK(53270)AND231)            JF
•890 PRINT"[CLEAR][c 4]":GOSUB1950:X=5152
 0:GOSUB900:GOTO930                          NE
•900 READA$:IFA$="X"THENPOKE53280,.:RETUR
 N                                           MJ
•910 FORA=1TOLEN(A$)STEP2:D=ASC(MID$(A$,A
 ,1))-48:FC=ASC(MID$(A$,A+1,1))-48           PP
•920 D=D+(D>10)*7:FC=FC+(FC>10)*7:POKEX,D
 *16+FC:POKE53280,A:X=X+1:NEXT:GOTO900       EE
•930 FORX=.TO63:POKE52608+X,.:NEXT            DM
•940 DIMDL(255,2),BO(16),SP(7),SB$(3,7),D
 $(4),L$(6),OA$(8),CS(7),M(15)               MG
•950 DIMHC(2),MH(15),M$(1),N$(2),G$(2),H(
 40),L(40)                                   GO
•960 JP=56320:HR=83:X=.:D=.:FC=.:CL=17:CD
 =2:VL=.:EL=.:ER=.:VS=.                      MI
•970 D(1)=1:D(2)=16:D(3)=-1:D(4)=-16:P=.:
 L=1:LF=10:FORX=.TO7:READSP(X):NEXT          NI
•980 TGL=16:CSM=.:CEM=192:V=53248:FORX=.T
 O39                                         EL
•990 L$=L$+CHR$(32):NEXT:FORX=1TO4:D$(X)=
 MID$("ESWN",X,1):NEXT                       FK
•1000 J=.:F=1:H=4:G=8:K=2:I=.02:R=.95:M=.
 :U=.:TL=388:DD=6:PL=214:ED=648:S=54272      OL
•1010 RI=.92:BC=V+38:Y=25:FL=550:ALL=479:
 WL=17:CR$=CHR$(13)                          EG
•1020 DEFFNJS(X)=15-(PEEK(JP)AND15):DEFFN
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JF(X)=((PEEK(JP)AND16)=.)                       CA
·1030 DEFFNCP(X)=FC*D(CD)+(CL+D(X)):DEFFN
SW(X)=(TGL-CSM)                                 CE
·1040 DEFFNTE(X)=(TL-CEM):DEFFNCM(X)=X*D(
CD)+CL:DEFFNMP(X)=CEM*256+1016+X                IG
·1050 DEFFNPM(X)=55296+970+(X*2):DEFFNSM(
X)=CEM*256+970+(X*2):DEFFNH(X)=294-HR           EH
·1060 DEFFNLF(LF)=((LF<5)*-K+(LF>=5ANDLF<
10)*-7+(LF>=10)*-5)                             ML
·1070 CEM=FNTE(.):PRINTCHR$(147):POKEED,C
EM:GOSUB2010:GOSUB760                           CM
·1080 FORX=.TO16:BO(X)=2[UPARROW]X:NEXT:F
ORX=1TO7:L$(X-1)=MID$("[WHITE][CYAN][c 7
][BLUE][PURPLE][c 4][BLACK]",X,1):NEXT          MM
·1090 HC(.)=2:HC(1)=8:HC(2)=10:M$(.)="[RV
SON]  ":M$(1)="[RVSOFF]  "                      LK
·1100 N$(1)="[YELLOW]GOLD":N$(2)="[RED]LI
FE"                                             DC
·1110 FORX=.TO7:READCS(X):NEXT:A$="":FORX
=1TO4:READB$:A$=A$+B$:NEXT:FORX=1TO223          OO
·1120 DL(X+15,.)=VAL(MID$(A$,X,1)):NEXT         LI
·1130 FORX=.TO8:READA$:OA$(X)=A$:NEXTX          AO
·1140 FORX=.TO15:READA:M(X)=A:NEXTX             JF
·1150 FORX=3TO.STEP-1:FORD=.TO7:READA$:SB
$(X,D)=A$:NEXTD,X                               BM
·1160 FORX=.TO18:W1$=W1$+"[c E][c R]":W2$
=W2$+"[c R][c E]":NEXT                          LF
·1170 FORX=.TO40:M=2703*(2[UPARROW]((X-20
)/12)):IFM>65535THENM=65535                     KK
·1180 H(X)=INT(M/BO(8)):L(X)=M-H(X)*BO(8)
:NEXT:FORX=.TO15                                EH
·1190 A=INT(RND(F)*223+16):IFDL(A,.)=.OR(
X=14ANDA<224)THEN1190                           GN
·1200 DL(A,F)=M(X):M(X)=A:MH(X)=X*G+F:NEX
T:DL(238,2)=BO(7)                               LB
·1210 POKEV+21,.:POKEV+23,127:POKEV+29,63
:X=V:GOSUB900:GOSUB2670                         IH
·1220 PRINT"[c 8][RVSON]  [4"$"] PRESS FI
RE BUTTON TO BEGIN [4"$"] [HOME][BLUE]":
WAITJP,16,16                                    OG
·1230 GOSUB2260:GOSUB2490:GOSUB1240:GOSUB
2430:GOTO1270                                   BA
·1240 POKEED,FNTE(.):PRINT"[CLEAR][RVSOFF
][5"[DOWN]"]";:POKEV+32,.:FORX=.TO255STE
P16:PRINTTAB(4);                                KL
·1250 FORJY=.TO15:PRINTM$(DL(X+JY,.));:IF
CL=X+JYTHENPRINT"[LEFT][LEFT]()";               IA
·1260 NEXTJY:PRINT:NEXTX:GOSUB760:POKEED,
CEM:POKEV+21,.:RETURN                           BO
·1270 PRINT"[CLEAR]":GOSUB760:POKEV+32,5:
GOSUB2700:GOSUB600:X=FRE(.):IT=TI+1000          NC
·1280 JY=FNJS(.):J=FNJF(.):IFJ=.THENONJYG
OTO1360,1370,,1390,70,70,,1380,70,70            GG
·1290 GOSUB20:LF=LF+I:POKEV+32,FNLF(LF):O
N-(RND(F)>.9)GOSUB30                            CN
·1300 B=DL(CL,F):IFBANDRND(F)+B/100>RITHE
NGOSUB1630                                      NN
·1310 IFJANDJY=KTHENGOSUB1450:GOSUB2700         OG
·1320 IFJTHENONU+FGOSUB1730,1750,70,1840,
70,1870,1890                                    PJ
·1330 IFTI>ITTHENGOSUB2330                      KE
·1340 ON-(VS=.)GOTO1280:Y=Y-F:ON-(Y>.)GOT
O1280:Y=FL:DD=DD+F:ON-(DD<6)GOTO1280            LD
·1350 PRINT"[CLEAR][4"[DOWN]"][RVSON][c 4
][5" "]YOUR LANTERN FUEL HAS EXPIRED![5"
 "]":GOSUB2450:GOTO1690                         OM
·1360 ON-(DL(CL+D(CD),.)=.)GOTO1410:CL=CL
+D(CD):GOTO1430                                 IP
·1370 ON-(DL(CL-D(CD),.)=.)GOTO1410:CL=CL
-D(CD):GOTO1430                                 BN
·1380 CD=CD+F:GOTO1400                          LP
·1390 CD=CD-F                                   DF
·1400 CD=CD+((CD=5)*H)+((CD=.)*-H):GOTO14
30                                              GM
·1410 IFCL<>WLTHENGOSUB2670:GOSUB2700:GOT
O1290                                           KC
·1420 IFL=ALLANDDL(CL,F)=7THEN1920              PG
·1430 GOSUB600:GOTO1290                         EL
·1440 REM COMMAND BAR                           PL
·1450 GOSUB2670:FORX=.TOG:IF(LANDBO(X))TH
ENPOKEFNPM(X),12                                AG
·1460 NEXT:X=.:A=FRE(.):A=.:IF(LAND(BO(U)
))THENPOKEFNPM(U),15                            DO
·1470 POKE198,.:WAITJP,16,.                     LI
·1480 POKEFNPM(X),.:POKEFNPM(X),F:IF(LAND
BO(A))THENPOKEFNPM(A),12:GOTO1500               NA
·1490 POKEFNPM(A),11                            NO
·1500 GOSUB20:JY=FNJS(.):ON-(RND(F)>.9)GO
SUB30                                           DM
·1510 P=L:IFJY=GTHENA=X:X=X+F+(X=10)*11         NO
·1520 IFJY=HTHENA=X:X=X-F+(X=.)*-11             NC
·1530 IFFNJF(.)AND(LANDBO(X))THENPOKEFNPM
(U),12:U=X:POKEFNPM(X),15:GOSUB2660             BA
·1540 IFFNJF(.)THENRETURN                       IK
·1550 IFJY=FAND(DL(CL,K)ANDBO(X))THENL=(L
ORBO(X)):DL(CL,K)=DL(CL,K)-BO(X)                IF
·1560 IFJY<>KTHEN1580                           HN
·1570 IF(LANDBO(X))ANDX>.THENL=(LAND(511-
BO(X))):DL(CL,K)=DL(CL,K)ORBO(X):U=.            HF
·1580 IFL<>PTHENGOSUB2670:GOSUB600:GOTO14
50                                              EK
·1590 ON-(X<=G)GOTO1480:GOSUB1600:GOTO148
0                                               IH
·1600 G(K)=INT(LF):PRINT"[HOME][DOWN]";TA
B(15)N$(X-G);": [c 8]";:A$=STR$(G(X-G))         JI
·1610 PRINTRIGHT$("[4"0"]"+(RIGHT$(A$,LEN
(A$)-F)),H):RETURN                              CN
·1620 REM MONSTER HITS                          FC
·1630 ON-(B=7)GOTO70:D=INT(RND(F)*3+F):PO
KEV+33,HC(D-F):LF=LF-(B/((LANDH)+F))-D          LH
·1640 FORT=.TO99:NEXT:POKEV+33,.:IFLF<.TH
EN1670                                          NG
·1650 POKEV+32,FNLF(LF):GOSUB2730:GOSUB27
00:RETURN                                       BC
·1660 REM PLAYER KILLED                         KL
·1670 PRINT"[CLEAR]":FORX=.TO16:POKEV+32,
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X:POKEV+33,X:NEXT:GOSUB2450:PRINT"[c 4][
DOWN][DOWN]"                                OM
•1680 PRINTTAB(11)"[RVSON][WHITE] S [YELL
OW] L [c 3] A [c 1] I [YELLOW] N [WHITE]
 !![DOWN][DOWN]"                            EP
•1690 GOSUB2490:PRINT"[HOME][6"[DOWN]"][R
ED][RIGHT][RVSON]DO YOU WISH TO ENTER TH
E CRYPT AGAIN? "                            CF
•1700 POKE198,.:WAIT198,1:GETA$:IFA$="N"T
HENPOKEED,4:POKE679,.:SYS679                HB
•1710 POKEV+21,.:PRINTCHR$(142):RUN         FK
•1720 REM LANTERN                           FK
•1730 IFVS=.THENVS=F:DD=.:GOSUB600:RETURN   AF
•1740 REM SWORD                             PM
•1750 IFB=.ORB=7ORRND(.)+LF/100<.5THENGOS
UB2730:GOSUB2700:RETURN                     HO
•1760 POKEV+33,5:FORT=.TO100:NEXT:POKEV+3
3,.:FORX=.TO15                              JO
•1770 ONF-(M(X)=.)GOTO1780,1810             PG
•1780 IFCL=M(X)THENMH(X)=MH(X)-ABS(RND(.)
+((LAND2)*F)+LF/6)+(LAND18>.)*-2            GP
•1790 ON-(MH(X)>.)GOTO1810:FORD=.TO16:FOR
T=.TO3:POKEV+39+T,D:NEXTT,D                 FA
•1800 M(X)=.:DL(CL,F)=.:POKEV+21,PEEK(V+2
1)AND240:GOSUB2450:GOSUB1820                OL
•1810 NEXT:GOSUB2730:GOSUB2700:RETURN       HB
•1820 LF=LF+B:DL(CL,K)=(DL(CL,K)ORBO(B)):
GOSUB600:GOSUB2670:G(F)=G(F)+B*100          KB
•1830 RETURN                                LL
•1840 REM WAND                              PA
•1850 ON-(B=G)GOTO1760:RETURN               DK
•1860 REM ELIXIR                            LA
•1870 LF=LF+20:L=L-BO(U):POKEFNPM(U),11:U
=.:RETURN                                   HI
•1880 REM MAP                               NH
•1890 A=PEEK(V+21):GOSUB2760:GOSUB1240:GO
SUB2430:GOSUB2670                           EC
•1900 GOSUB760:POKEV+21,A:POKEV+32,FNLF(L
F):GOSUB2700:RETURN                         NC
•1910 REM VICTORY!!                         HO
•1920 PRINT"[CLEAR][4"[DOWN]"][RVSON][YEL
LOW]";L$;"[c 3] BRAVE KNIGHT,YOU HAVE CO
NQUERED CRYPT![YELLOW]";L$                  LM
•1930 X=9:GOSUB1600:POKEPL,11:PRINT:PRINT
TAB(23)"[RED]MY HERO![9"[LEFT]"][DOWN][s
 N]":GOTO1690                               GB
•1940 REM COPY CHAR SET                     HC
•1950 POKE56333,127:POKE1,51                IJ
•1960 POKE781,9:POKE782,1:POKE90,.:POKE91
,216:POKE88,.:POKE89,248:SYS41964           MO
•1970 POKE1,55:POKE56333,129:PRINT"[CLEAR
]";:GOSUB2280                               IN
•1980 READA:IFA=-1THENRETURN                FE
•1990 FORX=.TO7:READD:POKE61440+A*8+X,D:N
EXT:GOTO1980                                IP
•2000 REM OPENING MARQUEE                   LB
•2010 PRINTCHR$(8)CHR$(142):PRINT"[CLEAR]
[RVSOFF]"SPC(8)"[BLUE][s U][3"[s C]"][s
I][s U][s C][s C][s I] [s U][s I] [s U][
s I][s U][s C][s C][s I][s U][3"[s C]"][
s I]"                                       KI
•2020 PRINT"[RIGHT][RIGHT][c 8][RVSON][sE
P][c *][RVSOFF]"SPC(4)"[BLUE][s B][s U][
s C][s I][s B][s B][s U][s I][s B] [s B]
[s J][s C][s K][s B][s B][s U][s I][s B]
[s J][s I] [s U][s K][3" "][c 8][RVSON][
sEP][c *]"                                  KL
•2030 PRINT"[RIGHT][RIGHT][RVSON][c M] [R
VSOFF]"SPC(4)"[BLUE][s B][s B] [s J][s K
][s B][s J][s K][s B] [s J][s I] [s U][s
 K][s B][s J][s K][s B] [s B] [s B][4" "
][c 8][RVSON][c M] "                        MB
•2040 PRINT"[RIGHT][RIGHT][RVSON][c M] [R
VSOFF]"SPC(4)"[BLUE][s B][s B][3" "][s B
][s U][s I][s J][s I] [s B] [s B] [s B][
s U][s C][s K] [s B] [s B][4" "][c 8][RV
SON][c M] "                                 PF
•2050 PRINT"[RIGHT][RIGHT][RVSON][c M] [R
VSOFF]"SPC(4)"[BLUE][s B][s B] [s U][s I
][s B][s B][s J][s I][s B] [s B] [s B] [
s B][s B][3" "][s B] [s B][4" "][c 8][RV
SON][c M] "                                 KD
•2060 PRINT"[RIGHT][RIGHT][RVSON][c M] [R
VSOFF]"SPC(4)"[BLUE][s B][s J][s C][s K]
[3"[s B]"] [s B][s B] [s B] [s B] [s B][
s B][3" "][s B] [s B][4" "][c 8][RVSON][
c M] "                                      NA
•2070 PRINT"[RIGHT][RIGHT][RVSON][c M] [R
VSOFF]"SPC(4)"[BLUE][s J][3"[s C]"][s K]
[s J][s K] [s J][s K] [s J][s C][s K] [s
 J][s K][3" "][s J][s C][s K][4" "][c 8]
[RVSON][c M] "                              OH
•2080 PRINT"[RIGHT][RIGHT][RVSON][c M] [R
VSOFF][3" "][c 5][s U][s C][s C][s I]"SP
C(24)"[c 8][RVSON][c M] "                   KK
•2090 PRINT"[RIGHT][RIGHT][RVSON][c M] [R
VSOFF]  [c 4][RVSON][c V][4"[c @]"][c C]
[RVSOFF][4" "][c 7][s U][s C][s C][s I][
s U][s C][s C][s I]  [c 2][s Q][RVSON][6
"[s F]"][RVSOFF][s Q] [c 8][RVSON][c M]
"                                           LD
•2100 PRINT"  [RVSON][c M] [RVSOFF]  [c 4
][c L][c 6][RVSON][s M][c @][c @][s N][c
 4][RVSOFF][c J][4" "][c 7][s B][s U][s
I][s B][s B][s U][s C][s K][3" "][YELLOW
][RVSON][c K][EP][PI][EP][PI][c L][RVSOF
F]  [c 8][RVSON][c M] "                     ID
•2110 PRINT"  [RVSON][c M] [RVSOFF]  [c 4
][c L][c 6][RVSON][c M][s M][s N][c G][c
 4][RVSOFF][c J][4" "][c 7][5"[s B]"][s
J][s I][4" "][YELLOW][RVSON][c K][PI][EP
][PI][EP][c L][RVSOFF]  [c 8][RVSON][c M
] "                                         JF
•2120 PRINT"  [RVSON][c M] [RVSOFF]  [c 4
][c L][c 6][RVSON][c M][s N][s M][c G][c
 4][RVSOFF][c J][4" "][c 7][5"[s B]"][s
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U][s K][4" "][YELLOW][RVSON][c K][EP][PI
][EP][PI][c L][RVSOFF]  [c 8][RVSON][c M
] "                                          HO
•2130 PRINT"  [RVSON][c M] [RVSOFF]  [c 4
][c L][c 6][RVSON][s N][c T][c T][s M][c
 4][RVSOFF][c J][4" "][c 7][s B][s J][s
K][3"[s B]"][5" "][YELLOW][RVSON][c K][P
I][EP][PI][EP][c L][RVSOFF]  [c 8][RVSON
][c M][SS]"                                  AB
•2140 PRINT"  [RVSON][c M] [RVSOFF]  [c 4
][RVSON][c V][4"[c T]"][c C][RVSOFF][4"
"][c 7][s J][s C][s C][s K][s J][s K][5"
 "][YELLOW][RVSON][c K][EP][PI][EP][PI][
c L][RVSOFF]  [c 8][RVSON][c M] "            BJ
•2150 PRINT"  [RVSON][c M] [RVSOFF]  [c 4
][RVSON][c V][4"[c T]"][c C][RVSOFF]"SPC
(14)"[c 2][s Q][RVSON][6"[s F]"][RVSOFF]
[s Q] [c 8][RVSON][c M] "                    PM
•2160 PRINT"  [RVSON][c M] [RVSOFF]"SPC(6
)"[c 1][s U][3"[s C]"][s I][s U][s C][s
C][s I] [s U][s C][s C][s I] [s U][s C][
s C][s I]"SPC(6)"[c 8][RVSON][c M] "         OJ
•2170 PRINT"  [RVSON][c M] [RVSOFF]"SPC(6
)"[c 1][s B][s U][s C][s C][s K][s B][s
U][s C][s K] [s B][s U][s I][s B] [s B][
s U][s I][s B]"SPC(6)"[c 8][RVSON][c M]
"                                            DH
•2180 PRINT"[WHITE][s U][s C][s K][s J][s
 C][s I][4" "][c 1][s B][s J][s I]  [s B
][s J][s I]  [s B][s J][s K][s B] [s B][
s J][s K][s B][4" "][WHITE][s U][s C][s
K][s J][s C][s I]"                           DA
•2190 PRINT" [c 4][c T][RVSON][c F][c D][
RVSOFF][c T][5" "][c 1][s B][s U][s K]
[s B][s U][s K]  [s B][s U][s I][s B] [s
 B][s U][s I][s J][s I][4" "][c 4][c T][
RVSON][c F][c D][RVSOFF][c T]"               MA
•2200 PRINT"  [c 2][RVSON][c V][c C][RVSO
FF]"SPC(6)"[c 1][s B][s B][3" "][s B][s
B][3" "][4"[s B]"] [s B][s B][s J][s I][
s B][5" "][c 2][RVSON][c V][c C]"            NG
•2210 PRINT"  [RVSON][cEP][cEP][RVSOFF]"S
PC(6)"[c 1][s B][s B][3" "][s B][s J][s
C][s I] [4"[s B]"] [s B][s B] [s B][s B]
[5" "][c 2][RVSON][cEP][cEP]"                CB
•2220 PRINT"  [RVSON][cEP][cEP][RVSOFF]"S
PC(6)"[c 1][s J][s K][3" "][s J][s C][s
C][s K] [s J][s K][s J][s K] [s J][s K]
[s J][s K][5" "][c 2][RVSON][cEP][cEP][5
"[RIGHT]"][RVSON][c P][c P]"SPC(31)"[c P
][c P]"                                      KB
•2230 PRINT"[RVSON] A [c 8][RVSOFF]3D[c 2
][RVSON] [c 8][RVSOFF]A[c 2][RVSON]DVENT
URE [c 8][RVSOFF]G[c 2][RVSON]AME [c 8][
RVSOFF]B[c 2][RVSON]Y [c 8][RVSOFF]C[c 2
][RVSON]LEVE [c 8][RVSOFF]B[c 2][RVSON]L
AKEMORE ";                                   AE
•2240 PRINT"[c 5] [4"-"] PLEASE WAIT..OPE
NING DUNJONS![4"-"][UP][RIGHT]";:RETURN      BE
•2250 REM LOGO                               JC
•2260 PRINT"[CLEAR]";:FORX=.TO11:PRINT"[R
VSON]";W1$:PRINT"[RVSON]";W2$:NEXT:POKEP
L,8:PRINT                                    IF
•2270 FORX=.TO13:PRINTTAB(14)LEFT$(L$,13)
:NEXT:PRINTTAB(14)LEFT$(L$,13);              NK
•2280 PRINT"[HOME][3"[DOWN]"]"TAB(7)"[s U
][25"[s C]"][s I]                            IP
•2290 PRINTTAB(7)"[c Q][RVSON][3"="]CRYPT
 OF FEAR==V8.1[3"="][RVSOFF][c W]            CK
•2300 PRINTTAB(7)"[c Q][RVSON]BY CLEVELAN
D M. BLAKEMORE[RVSOFF][c W]                  NA
•2310 PRINTTAB(7)"[s J][25"[s C]"][s K]":
RETURN                                       AO
•2320 REM MONSTER MOVEMENT                   EK
•2330 FC=15:FORX=.TOFC:ONF-(M(X)=.)GOTO23
40,2400                                      KA
•2340 IFCL<M(X)-GTHENA=M(X)+D(H)             FF
•2350 IFCL>M(X)+GTHENA=M(X)+D(K)             IH
•2360 IFCL>M(X)ANDCL<M(X)+GTHENA=M(X)+D(F
)                                            ML
•2370 IFCL<M(X)ANDCL>M(X)-GTHENA=M(X)+D(F
+K)                                          AA
•2380 IFA<.ORA>255THEN2400                   KO
•2390 IFDL(A,.)ANDDL(A,F)=.THENDL(A,F)=DL
(M(X),F):DL(M(X),F)=.:M(X)=A                 CB
•2400 NEXT                                   OL
•2410 D=DL(CL,F):IFDTHENONDGOSUB70,2580,2
610,2540,70,70,70,2640:GOSUB2700             EM
•2420 POKEV+21,.:FC=.:GOSUB780:IT=TI+1000
:RETURN                                      DB
•2430 FORT=.TO3000:NEXT:RETURN               CL
•2440 REM SOMETHING DIED                     OK
•2450 POKES+5,15:POKES+23,239:POKES+24,15
+32:POKES+4,33                               CI
•2460 A=200:FORSW=100TO50STEP-.5:POKES+22
,SW:A=A*.93:POKES+1,A:NEXT                   IM
•2470 POKES+4,32:FORT=.TO30:NEXT:POKES+23
,.:POKES+24,.:RETURN                         NO
•2480 REM CRYPT WHISPERS                     DJ
•2490 GOSUB2760:POKES+5,16*11:POKES+6,16*
15+11:POKES+23,239:POKES+24,15+32            CL
•2500 FORN=.TO5:POKES+1,INT(RND(1)*10)+1:
FORSW=.TOINT(RND(1)*200):POKES+4,129         IM
•2510 POKES+22,SW:NEXT:POKES+4,128:FORT=.
TO400:NEXTT,N                                LF
•2520 FORT=.TO1500:NEXT:POKES+23,.:POKES+
24,15:RETURN                                 DB
•2530 REM BLOB                               JL
•2540 POKES+5,15:POKES+23,239:POKES+24,15
+32:POKES+4,33                               PK
•2550 FORSW=.TO150STEP5.25:POKES+22,SW:PO
KES+1,INT(RND(1)*10):NEXT                    DA
•2560 POKES+4,32:FORT=.TO400:NEXT:POKES+2
3,.:POKES+24,15:RETURN                       PD
•2570 REM COBRA                              AE
•2580 GOSUB2760:POKES+5,155:POKES+6,245:P
```

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OKES+4,129:FORX=50TO55:POKES,D                PL
•2590 FORT=35TO55:POKES+1,T:NEXTT,X:POKES
+4,128:FORT=.TO100:NEXT:RETURN                OH
•2600 REM IMP                                 KA
•2610 GOSUB2760:D=180:FORA=.TO9:POKES+4,3
3:POKES+1,D:FORT=.TO5                         IA
•2620 NEXT:POKES+4,32:FORT=.TO40:NEXT:D=D
*.95:NEXTA:RETURN                             OM
•2630 REM DEMIGORGON                          MJ
•2640 GOSUB2760:POKES+5,8:POKES+6,255:POK
ES+4,23:F1=8:F2=4:FORZ=1TO30:POKES+1,F1       NL
•2650 POKES+15,F2:F2=F2*1.01:F1=F1+1:NEXT
Z:POKES+6,15:RETURN                           BI
•2660 REM BEEP                                BP
•2670 GOSUB2760:POKES+5,96:POKES+6,96:POK
ES+4,23:POKES+2,85:POKES+1,36                 PH
•2680 FORX=.TO10:NEXT:POKES+6,15:RETURN       HN
•2690 REM SINISTER MUSIC                      AH
•2700 GOSUB2760:POKES+5,4:POKES+12,4:POKE
S+19,4:POKES+6,241:POKES+13,241               GP
•2710 POKES+20,241:POKES+4,33:POKES+11,33
:POKES+19,33:GOSUB30:RETURN                   MB
•2720 REM SLASH                               KG
•2730 GOSUB2760:POKES+1,25:POKES,5:POKES+
5,20:POKES+4,129                              IJ
•2740 FORT=.TO75:NEXT:POKES+4,128:RETURN      MP
•2750 REM CLEAR SID                           KE
•2760 FORP=STOS+24:POKEP,.:NEXT:POKES+24,
15:RETURN                                     OF
•2770 REM CHARACTER DATA                      OM
•2780 DATA159,231,231,231,231,129,195,231
,255                                          GG
•2790 DATA65,,62,107,85,34,20,8,.             LH
•2800 DATA77,128,64,32,16,8,4,2,1             LG
•2810 DATA78,1,2,4,8,16,32,64,128             CH
•2820 DATA113,,,,,255,15,15,15                AB
•2830 DATA114,,,,,255,240,240,240             IH
•2840 DATA163,231,129,219,195,219,129,195
,129                                          FB
 2850 DATA164,247,247,247,247,247,227,247
,247                                          PK
•2860 DATA165,189,129,137,189,165,129,195
,231                                          LP
•2870 DATA166,231,219,231,231,231,231,231
,231                                          BM
•2880 DATA167,60,90,102,118,118,118,181,1
95                                            OD
•2890 DATA168,231,195,231,195,129,126,129
,195                                          JO
•2900 DATA169,255,255,231,219,219,231,255
,255                                          PF
•2910 DATA170,255,193,148,170,221,235,247
,255                                          FL
•2920 DATA171,255,129,129,129,195,231,231
,129                                          LD
•2930 DATA212,189,189,189,189,189,189,189
,189                                          II
•2940 DATA40,1,1,7,11,9,3,4,12                CM
•2950 DATA41,128,128,224,208,144,192,32,4
8                                             PN
•2960 DATA201,255,223,207,199,195,193,225
,255                                          AG
•2970 DATA83,255,201,193,193,227,247,255,
255                                           OF
•2980 DATA213,255,251,243,227,195,131,135
,255,-1                                       II
•2990 REM MONSTER SPRITE DATA                 IB
•3000 DATA 000000000000000000000000021840
253CA454FF2A8DFFB197FFE19BFFD1FFFFFFDB        GK
•3010 DATA FFD3D8FF13481812483C12447E2240
7E02203C040042000000000000000000000000        GK
•3020 DATA 000000000000F80001FC0002AA0002
72000202000104000088000070200070400070        DJ
•3030 DATA 40007060007830003C1C001E0E003C
3C0078F0003FE0001FC0000400400C7C6012BA        NK
•3040 DATA 9011931009FF2007BBC001C7001F7D
E03F83F0F3FF7CA17A1EC0FC05C3FE03C7CF03        NJ
•3050 DATA CE0383CE01C6F701EEE387FCD1E65C
68676A13E0100400000C70CC1289EE31C1FF64        NI
•3060 DATA 63F1C23264C6642A6CCCAA66DC24E3
7E71E33FFFE63EBAFC3C827A1800318C447987        PH
•3070 DATA 45EBCFFFFE7BF7DE3FBFFE6DEDB7FF
FFFF04003C00007E020042020066020066023D        NK
•3080 DATA BD8267BDC277FFE243DBE25AFF777E
663F7E5A1E3CFF00017E8003FFC00781E00F00        PN
•3090 DATA F00E00700E00700E00703E007C1E03
FFC005FFA00EFF701F7EF81FFFF81FFFF83FC3        FN
•3100 DATA FC3F00FC3E007C3C003C3C003C3C00
3C3C003C3C003C3C003C3C003CFC003FFC003F        KM
•3110 DATA 0000000000000000FF00000000007E
0000FF0000810000810200E70200E70200E702        DL
•3120 DATA 737EC2FF7EE28D7EE2CF7EF285FFF2
B7BDFAB5BDFAB7FFFAFDE7FAFDE7BAFC993FF8        AG
•3130 DATA FF1F71FF8FFF005400007C00004400
007C0000FE00017D0003BB8007C7C00FEFE00D        GP
•3140 DATA FF6018EE301C7C7010EE1001FF0001
EF0000FE00006C0000FE0000EE0001FF0003EF        OD
•3150 DATA 80FF38770E20FF8221F7C203FFE003
F7E003FFE003F7E003FFE001F7C000FF8000F7        DO
•3160 DATA 8000FF8000F78000FF8001F7C001FF
C003F7E003FFE007F7F00FFFF81FF7FC040000        BP
•3170 DATA 00000000000000000000004900005D
00007F00005500006300007F0000BE80015D60        GB
•3180 DATA 07A2F80FDDFC1FE3FC1DFFDC1DF7DC
19FFCC38F78E387F0E307706041C0070220088        BJ
•3190 DATA 216D0820C60824FE482ABAA8309218
236DC807A9E00DBAE00CC2600E7DC007FA8001        PG
•3200 DATA BA8000ED4000C60001830001818000
818000420001C38000E3FFDEE1F586C1FAFFBA        EM
•3210 DATA F5877F750105BA8004BF00097FC000
E0E001C0600380E00300C00380C00181800183        JG
•3220 DATA 00018300018380003C1800301E00781
F01A425C0060001C900012880021880 02184C6       OK
•3230 DATA 418383818383A185C3A185FFD1897E
A9953CC953998A22FF440CEB301F6B787FBEF8        GN
•3240 DATA 77DDF8E5E3B8C2FF5CC318CEE1FF8E
```

```
000FE07C0FC07C0F807C0F807C1F00381E0038   MN
•3250 DATA 1F007C1F00F83F00F03E01E03E01E0
 1E01E01E03C00E03C00E478007878003878003  DC
•3260 DATA 87000787800AC760148A90FC7FBF7E
 FBC0EFFBF7EFFBF7EFFDFFEFF60C1FF7FFEFF3  GI
•3270 DATA FC6FF27BAFE3B7E7EFD737FFA53F78
 B49F715AE32139E001FFE003FFE003FFF003FF  PG
•3280 DATA F007E1F807C0F8FC0780000860001 8
 30303010E06019C0C00DC08007C08023EF8021  KA
•3290 DATA FF8020FF8040BF80419F80638F8053
 C3806BFF8097FF811BFF8615FF443FBD283FDD  CM
•3300 DATA 101FEFFC0001E0000610 0C0C180708
 0C0398060 3B00303E001F7C401FF8401FF0401  IH
•3310 DATAFD0201F98201F1C601C3CA01FFD601F
 FE901FFD881FFA861BDFC22BBFC14F7F808FC,X  AJ
•3320 REM BIT MASKS                      AB
•3330 DATA 0,4,6,7,15,48,64,128          IO
•3340 REM MONSTER COLORS                 MO
•3350 DATA0,5,2,6,15,1,7,5               JG
•3360 REM DUNGEON MAP                    KN
•3370 DATA"010[3"1"]01010[4"1"]00[3"1"]01
 010[3"1"]0010010[7"1"]01001001 0"        PA
•3380 DATA"1[5"0"]10[4"1"]00[9"1"]0010100
 1010101001010100[4"1"]0"                EI
•3390 DATA"0[8"1"]00101010101 00101[5"0"][
 3"1"]0011[6"0"]101001100[5"1"]00"       FN
•3400 DATA"[6"1"]01001001[3"0"]1[4"0"][8"
 1"]00[6"1"]001[3"0"]1[4"0"]1010[9"1"]0"  HF
•3410 REM OBJECT SHAPE STRINGS           FD
•3420 DATA "","[4"[UP]"][RIGHT][RVSON][c
 *][DOWN][LEFT][s T][DOWN][LEFT][s T][DOW
 N][LEFT][s T][DOWN][LEFT][c D][DOWN][LEF
 T][c N]"                                HN
•3430 DATA "[UP][RVSON][c *][RIGHT][RIGHT
 ][sEP][DOWN][4"[LEFT]"][s B][c A][c S][s
  B][DOWN][4"[LEFT]"][s B][c Z][c X][s B]
 "                                       GM
•3440 DATA "[3"[UP]"][RIGHT][s X][DOWN][L
 EFT][s +][DOWN][LEFT][s B][DOWN][LEFT][s
  B][DOWN][LEFT][s B]","[LEFT][LEFT][s W]
 "                                       OE
•3450 DATA "[UP][3"[LEFT]"][RVSON][RIGHT]
 [s E][RIGHT][DOWN][3"[LEFT]"][sEP][c T][
 c *][DOWN][3"[LEFT]"][RVSOFF][c *][RVSON
 ][c T][RVSOFF][sEP]"                    FC
•3460 DATA "[UP][3"[LEFT]"][s N][s M][s N
 ][c G][DOWN][4"[LEFT]"][4"[c G]"][DOWN][
 4"[LEFT]"][4"[c G]"]","[LEFT][s A]"     OM
•3470 DATA "[UP][LEFT][LEFT][RVSON][s F][
 s F][DOWN][LEFT][LEFT][RVSOFF][c *][sEP]
 [DOWN][LEFT][LEFT][RVSON][sEP][c *]"    PH
•3480 REM MONSTER TYPES                  MH
•3490 DATA 1,1,2,2,3,3,4,5,5,5,6,6,6,6,7,
 8                                       IF
•3500 REM MONSTER SHAPE DATA             FH
•3510 DATA %,&,',(,),),",",/             CD
•3520 DATA %,&,',(,),),",",/             PF
•3530 DATA %,&,',(,"*+","*+","-.","01"   BH
•3540 DATA %,&,',(,"*+","*+","-.","2345"  NJ
•3550 REM SPRITE LOCATIONS               NM
•3560 DATAA0BFA0958A6BBA6BA0AAA081AC8DAC9
 7,X                                     MK
```

MARAUDER
FROM PAGE 60

Starting address in hex: C000
Ending address in hex: C867
SYS to start: 49152

***Flankspeed* required for entry! See page 81.**

```
C000: A9 00 8D B3 02 8D B1 02 2E
C008: A9 06 8D 21 D0 A9 1F 20 20
C010: D2 FF A9 93 20 D2 FF AD C0
C018: 1F D0 A9 12 20 D2 FF A2 59
C020: 00 A0 26 18 20 F0 FF A9 B9
C028: AB 20 D2 FF E8 E0 0B D0 6C
C030: F3 A9 C8 8D AB 02 A9 00 7B
C038: 8D AC 02 A2 18 A0 05 18 EC
C040: 20 F0 FF A9 1C 20 D2 FF 0A
C048: A0 00 B9 0D C5 20 D2 FF 68
C050: C8 C0 18 D0 F5 A2 17 A0 13
C058: 09 18 20 F0 FF A9 1F 20 73
C060: D2 FF A2 00 BD 73 C5 20 EC
C068: D2 FF E8 E0 0D D0 F5 A2 7B
C070: 02 A0 06 18 20 F0 FF A2 E4
C078: 00 BD FC C4 20 D2 FF E8 D3
C080: E0 11 D0 F5 A2 04 A0 01 81
C088: 18 20 F0 FF A2 00 BD 54 66
C090: C5 20 D2 FF E8 E0 20 D0 04
C098: F5 A9 17 8D A7 02 A9 BF EF
C0A0: 8D 15 D0 A2 05 A9 0B 9D 0E
C0A8: F8 07 CA D0 F8 20 B3 C0 D1
C0B0: 4C D9 C0 A2 0C 8E AA 02 81
C0B8: 20 97 E0 CE AA 02 AE AA 26
C0C0: 02 A5 8B 38 E9 71 0A 0A 9B
C0C8: 0A 69 37 9D 00 D0 CE AA 5B
C0D0: 02 A9 02 CD AA 02 D0 E0 AA
C0D8: 60 A9 3E 8D 1C D0 A9 0E 53
C0E0: 8D 25 D0 A9 0F 8D 26 D0 A1
C0E8: A2 05 8A 9D 27 D0 CA D0 4C
C0F0: F9 A9 0E 8D F8 07 A9 0D E6
C0F8: 8D FE 07 8D FF 07 A9 0B D5
C100: 8D 27 D0 A9 02 8D 2D D0 BC
C108: A9 00 8D 2E D0 A9 78 8D ED
C110: 00 D0 A9 3E 8D 10 D0 A9 E0
C118: C8 8D 01 D0 A9 FF 8D 0E 85
C120: D0 A9 E1 8D 0F D0 A9 80 14
C128: 8D 17 D0 A9 81 8D 1D D0 44
C130: A9 00 8D 1B D0 AD 1E D0 EF
C138: A2 3F BD 80 C5 9D 80 03 3F
C140: CA E0 FF D0 F5 A2 3F BD 52
C148: BF C5 9D C0 03 CA E0 FF DA
C150: D0 F5 A2 3E BD FE C5 9D 18
C158: C0 02 CA E0 FF D0 F5 A2 30
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C160: 3F BD 3C C6 9D 40 03 CA 0C
C168: E0 FF D0 F5 A9 00 8D 20 67
C170: D0 8D 21 D0 A9 CE 8D A8 6F
C178: 02 20 7B C6 A9 00 85 C6 D2
C180: 20 E4 FF C9 85 D0 0D A9 5C
C188: 0B 8D B0 02 A9 01 8D AF BB
C190: 02 4C C4 C1 C9 86 D0 0D 93
C198: A9 0B 8D B0 02 A9 02 8D C6
C1A0: AF 02 4C C4 C1 C9 87 D0 47
C1A8: 0D A9 0B 8D B0 02 A9 03 57
C1B0: 8D AF 02 4C C4 C1 C9 88 15
C1B8: D0 C6 A9 0A 8D B0 02 A9 ED
C1C0: 04 8D AF 02 F8 AD B3 02 60
C1C8: 38 CD B1 02 B0 06 AD B1 98
C1D0: 02 8D B3 02 D8 20 70 C7 47
C1D8: A2 18 A0 00 18 20 F0 FF 5D
C1E0: A9 9E 20 D2 FF AE B3 02 80
C1E8: 20 C7 C4 A9 00 8D B1 02 80
C1F0: AD AF 02 18 69 30 8D AA 3A
C1F8: 07 AE 01 DC E0 FF F0 F9 58
C200: A2 18 A0 23 18 20 F0 FF A7
C208: AE B1 02 A9 9A 20 D2 FF A1
C210: 20 C7 C4 A0 05 8C AA 02 9B
C218: 98 0A AA BD 00 D0 38 ED 1A
C220: AA 02 B0 0B 48 B9 4C C5 9C
C228: 4D 10 D0 8D 10 D0 68 9D CA
C230: 00 D0 88 D0 E0 A5 A2 8D 11
C238: 26 D0 AD 1F D0 29 01 D0 C7
C240: 13 AD 1E D0 8D AD 02 29 56
C248: 3F F0 36 AD AD 02 29 41 76
C250: C9 01 D0 2D A9 01 8D 27 78
C258: D0 20 70 C7 A2 E6 86 A2 34
C260: A5 A2 8D 27 D0 20 97 E0 C6
C268: A5 8B 38 E9 71 0A AA 9D 7F
C270: 8A 03 9D CA 03 A5 A2 D0 82
C278: E7 A9 00 8D 27 D0 4C 08 E3
C280: C0 AD 01 DC C9 FE D0 0D 73
C288: AD 01 D0 C9 3C F0 06 CE D3
C290: 01 D0 CE 01 D0 AD 01 DC 8E
C298: C9 FD D0 0D AD 01 D0 C9 87
C2A0: D6 F0 06 EE 01 D0 EE 01 1F
C2A8: D0 AD 01 DC C9 FB D0 0D A8
C2B0: AD 00 D0 C9 28 F0 06 CE E6
C2B8: 00 D0 CE 00 D0 AD 01 DC B4
C2C0: C9 F7 D0 0D AD 00 D0 C9 A8
C2C8: DC F0 06 EE 00 D0 EE 00 4B
C2D0: D0 AD 01 DC 29 10 D0 24 5B
C2D8: AD AC 02 D0 1F A9 40 4D 5C
C2E0: 15 D0 8D 15 D0 AD 00 D0 B8
C2E8: 18 69 08 8D 0C D0 AD 01 8B
C2F0: D0 18 69 06 8D 0D D0 A9 5E
C2F8: 01 8D AC 02 AD AC 02 C9 5C
C300: 01 F0 03 4C A8 C3 AD 0C 67
C308: D0 18 69 08 8D 0C D0 90 5D
C310: 16 AD 15 D0 49 40 8D 15 E5
C318: D0 A9 00 8D AC 02 8D 0C 68
C320: D0 8D 0D D0 4C A8 C3 A2 B7
C328: 05 BD 4C C5 09 40 8D AE 82
C330: 02 AD AD 02 2D AE 02 CD 3B
C338: AE 02 F0 06 CA D0 EA 4C B2
C340: A8 C3 BD 27 D0 8D 21 D0 E1
C348: 8D 20 D0 AD AE 02 4D 15 87
C350: D0 8D 15 D0 A0 FA 84 A2 57
C358: A4 A2 D0 FC A9 00 8D 21 C5
C360: D0 8D 20 D0 AD 0E D0 18 54
C368: 69 03 8D 0E D0 90 05 A9 80
C370: FF 8D 0E D0 A9 00 8D AC C0
C378: 02 8A 18 F8 6D B1 02 8D C4
C380: B1 02 D8 20 21 C7 AD 15 D8
C388: D0 29 3E D0 1B A9 3E 4D E1
C390: 15 D0 8D 15 D0 A9 3E 8D 5F
C398: 10 D0 20 B3 C0 CE B0 02 8F
C3A0: CE AF 02 D0 03 4C 0E C8 18
C3A8: AE A7 02 38 E0 0C 90 42 F8
C3B0: 38 E0 17 B0 0A 20 97 E0 34
C3B8: A5 8E 38 C9 80 B0 33 AD 01
C3C0: A8 02 C9 CE F0 03 CE A7 6E
C3C8: 02 A0 26 AE A7 02 18 20 22
C3D0: F0 FF A9 CE 20 D2 FF A0 CD
C3D8: 26 AD A7 02 ED B0 02 AA A1
C3E0: 18 20 F0 FF A9 CE 20 D2 75
C3E8: FF 8D A8 02 CE A7 02 4C E5
C3F0: 25 C4 AD A8 02 C9 CD F0 BB
C3F8: 03 EE A7 02 A0 26 AE A7 B1
C400: 02 18 20 F0 FF A9 CD 20 C2
C408: D2 FF A0 26 AD A7 02 ED E6
C410: B0 02 AA 18 20 F0 FF A9 40
C418: CD 20 D2 FF EE A7 02 8D FE
C420: A8 02 4C 25 C4 A9 00 85 30
C428: FB A9 04 85 FC A2 18 A0 AF
C430: 00 C8 B1 FB 88 91 FB C8 85
C438: C0 27 D0 F5 A9 20 91 FB 3E
C440: 18 A5 FB 69 28 85 FB A5 B2
C448: FC 69 00 85 FC A0 00 CA 9C
C450: D0 DF EE AB 02 D0 26 A9 3E
C458: E6 8D AB 02 AE 0E D0 CA D2
C460: 8E 0E D0 E0 CB D0 16 A0 02
C468: FD 84 A2 A4 A2 D0 FC AE 51
C470: 01 D0 E8 8E 01 D0 E0 D7 44
C478: D0 ED 4C 54 C2 38 A9 1D 99
C480: ED F8 07 8D F8 07 A2 00 9E
C488: A9 00 9D 00 D4 E8 E0 19 87
C490: D0 F8 A9 F0 8D 00 D4 A9 01
C498: 21 8D 01 D4 A9 08 8D 05 61
C4A0: D4 A9 68 8D 16 D4 A9 01 AA
C4A8: 8D 17 D4 A9 4F 8D 18 D4 95
C4B0: A9 81 8D 04 D4 A2 FF CA AF
C4B8: D0 FD A9 80 8D 04 D4 A9 C1
C4C0: 00 8D 18 D4 4C 00 C2 A9 F3
C4C8: 12 20 D2 FF 8A 8D B2 02 9A
C4D0: 29 F0 6A 6A 6A 6A 18 69 16
C4D8: 30 20 D2 FF AD B2 02 29 87
C4E0: 0F 18 69 30 20 D2 FF A9 3E
C4E8: 30 20 D2 FF A9 30 20 D2 D8
C4F0: FF A9 92 20 D2 FF A9 1F E8
C4F8: 20 D2 FF 60 C2 4D C2 41 60
```

```
C500: C2 52 C2 41 C2 55 C2 44 38
C508: C2 45 C2 52 C2 A0 46 55 24
C510: 45 4C 20 52 45 4D 41 49 31
C518: 4E 49 4E 47 20 20 D1 D1 29
C520: D1 D1 D1 D1 D1 12 9C 43 2B
C528: 4F 4E 47 52 41 54 55 4C 96
C530: 41 54 49 4F 4E 53 21 21 42
C538: 59 4F 55 20 48 41 56 45 7B
C540: 20 53 41 56 45 44 20 42 37
C548: 41 53 45 21 01 02 04 08 52
C550: 10 20 40 80 12 49 4E 50 3B
C558: 55 54 20 53 4B 49 4C 4C A2
C560: 20 4C 45 56 45 4C 3A 46 7A
C568: 31 2D 46 33 2D 46 35 2D 16
C570: 46 37 92 20 54 55 4E 4E E6
C578: 45 4C 20 20 20 20 C3 3E 8C
C580: 00 00 00 00 00 00 00 00 80
C588: 00 00 00 00 7F FF FE 00 07
C590: 10 00 83 FE 00 FF 71 00 94
C598: FF F0 80 87 FF C0 03 7F D4
C5A0: E0 01 FF 00 12 00 90 0F 34
C5A8: FF C0 00 00 00 00 00 00 69
C5B0: 00 00 00 00 00 00 00 00 B0
C5B8: 00 00 00 00 00 00 00 00 B8
C5C0: 00 00 00 00 00 00 00 00 C0
C5C8: 00 00 00 03 FF 00 00 10 DB
C5D0: 00 03 FE 00 FF 71 00 FF 44
C5D8: F0 80 07 FF C0 03 7F E0 75
C5E0: 01 FF 00 12 00 90 0F FF 93
C5E8: E0 00 00 00 00 00 00 00 C9
C5F0: 00 00 00 00 00 00 00 00 F0
C5F8: 00 00 00 00 00 00 00 00 F8
C600: 00 00 00 00 00 00 00 00 00
C608: 00 00 00 00 00 00 00 00 08
C610: 01 00 00 01 40 00 01 41 94
C618: 00 3D AA 40 FD 6A A8 3D 8E
C620: AA 40 01 41 00 01 40 00 8E
C628: 01 00 00 00 00 00 00 00 29
C630: 00 00 00 00 00 00 00 00 30
C638: 00 00 00 00 00 00 00 00 38
C640: 00 00 00 00 00 00 00 00 40
C648: 00 00 00 00 00 00 00 00 48
C650: 00 00 00 00 00 00 00 FF 50
C658: FF FF FF FF FF FF FF FF 58
C660: 00 00 00 00 00 00 00 00 60
C668: 00 00 00 00 00 00 00 00 68
C670: 00 00 00 00 00 00 00 00 70
C678: 00 00 00 A2 00 A9 00 9D 62
C680: 00 D4 E8 E0 19 D0 F8 A2 A4
C688: 00 BD BD C6 F0 24 8D 01 6E
C690: D4 E8 BD BD C6 8D 00 D4 F2
C698: A9 F0 8D 06 D4 A9 21 8D F3
C6A0: 04 D4 A9 0F 8D 18 D4 A0 4D
C6A8: F9 84 A2 A4 A2 D0 FC 4C 2B
C6B0: 89 C6 A9 00 8D 18 D4 A9 CE
C6B8: 20 8D 04 D4 60 16 60 10 26
C6C0: C3 0F D2 16 60 10 C3 0F BF
C6C8: D2 16 60 10 C3 0F D2 16 DD
C6D0: 60 10 C3 0F D2 0F D2 16 DE
C6D8: 60 10 C3 0F D2 16 60 10 75
C6E0: C3 0F D2 16 60 12 D1 15 F5
C6E8: 1F 16 60 12 D1 15 1F 16 AC
C6F0: 60 12 D1 12 D1 1C 31 12 78
C6F8: D1 16 60 1C 31 1C 31 12 ED
C700: D1 16 60 19 1E 10 C3 0F 62
C708: D2 16 60 10 C3 0F D2 0F 16
C710: D2 16 60 10 C3 16 60 10 B3
C718: C3 0F D2 0F D2 0F D2 00 81
C720: 00 A2 00 A9 00 9D 00 D4 DE
C728: E8 E0 19 D0 F8 A9 1C 8D 28
C730: 01 D4 A9 31 8D 00 D4 A9 EC
C738: 0A 8D 05 D4 A9 F0 8D 06 D7
C740: D4 A9 81 8D 04 D4 A9 0F 5F
C748: 8D 18 D4 A0 FD 84 A2 A4 2D
C750: A2 D0 FC A9 12 8D 01 D4 DF
C758: A9 D1 8D 00 D4 A0 FC 84 58
C760: A2 A4 A2 D0 FC A9 00 8D 4F
C768: 18 D4 A9 80 8D 04 D4 60 46
C770: A2 00 A9 00 9D 00 D4 E8 18
C778: E0 19 D0 F8 A2 00 BD B7 54
C780: C7 F0 29 8D 01 D4 E8 BD 6C
C788: B7 C7 8D 00 D4 A9 78 8D 1A
C790: 05 D4 A9 F0 8D 06 D4 A9 17
C798: 81 8D 04 D4 A9 0F 8D 18 DE
C7A0: D4 A0 FC 84 A2 A4 A2 D0 52
C7A8: FC 4C 7E C7 A9 00 8D 18 87
C7B0: D4 A9 80 8D 04 D4 60 0A 80
C7B8: 0B 12 14 1B 27 32 44 4B ED
C7C0: 5F 73 78 87 8C 91 A5 BE 16
C7C8: C8 DD E7 1C 0A 00 00 0F 8C
C7D0: 39 E0 0F FF E0 1A AA B0 50
C7D8: 0F FF E0 07 FF C0 03 FF 93
C7E0: 80 00 BD 00 00 BD 00 18 F4
C7E8: FF 18 3C BD 3C 18 BD 18 25
C7F0: 18 FF 18 18 E7 18 19 E7 3A
C7F8: 98 3F FF FC 7F FF FE F1 3E
C800: 11 8F F5 57 BF F1 11 9F 50
C808: F5 5D BF F1 51 8F A9 0E A5
C810: 8D F8 07 A9 81 8D 15 D0 3C
C818: A9 80 8D 10 D0 A2 07 8E E8
C820: 2E D0 A2 FF 8D 0E D0 A9 D7
C828: 96 8D 0F D0 A2 3F BD CF 9B
C830: C7 9D 40 03 CA E0 FF D0 55
C838: F5 A0 FC 84 A2 A4 A2 D0 0B
C840: FC CE 0E D0 D0 F3 A2 03 55
C848: A0 01 18 20 F0 FF A2 00 B5
C850: BD 25 C5 20 D2 FF E8 E0 B5
C858: 28 D0 F5 20 7B C6 4C 08 FD
C860: C0 00 FF 00 FF 00 FF 00 21
```

Problems Entering a Program?

Ahoy!'s technical department is ready, willing, and (in most cases) able to help. Call 212-239-6089 from 8:30-5:00 p.m. EST; if busy or no answer after three or more rings, call 212-239-0855.

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SCREEN WIZARDRY
FROM PAGE 31

```
•10 REM DOWNWARD VERTICAL SCROLLING                     MK
•20 PRINTCHR$(8)CHR$(142)                               LB
•30 POKE53281,.:POKE53280,.:PRINT"[CLEAR]
 [RVSON][RED]SCORE [4"0"]  ALIEN HELLSPAW
 N[3" "]SHIPS [3"[s Z]"]"                               KG
•40 POKE646,RND(1)*16:PRINT"[HOME][DOWN][
 DOWN]";TAB(RND(1)*40);CHR$(46+(RND(.)>.9
 )*-163)                                                NO
•50 POKE218,PEEK(218)OR128                              HC
•60 PRINT"[HOME][DOWN][LEFT]";CHR$(148)                 LG
•70 GETA$:IFA$=""THEN40                                 HL
•80 REM SCROLLING COLOR BARS                            PC
•90 B$="[RVSON]":FORX=.TO39:B$=B$+CHR$(32
 ):NEXT                                                 GB
•100 PRINT"[CLEAR]"TAB(11)"COLOR BAR SCRO
 LLING"                                                 GP
•110 PRINT"[DOWN][DOWN]"TAB(14)"[c @][c P
 ][c I][c O][c I][RVSON][c U][c U][RVSOFF
 ][c I][RVSON][c U][RVSOFF][c O][c P][c O
 ][c @]"                                                NK
•120 PRINTTAB(10)"[c @][c O][c I][RVSON][
 c Y][13" "][c Y][c U][c U][RVSOFF][c O][
 c @]"                                                  CL
•130 PRINTTAB(6)"[c @][c P][c I][RVSON][c
  Y][22" "][c Y][RVSOFF][c I][c @]"                     EG
•140 PRINTTAB(5)"[RVSON][sEP][29" "][c *]
 "                                                      MO
•150 PRINTTAB(4)"[RVSON][sEP][30" "][c N]
 "                                                      JF
•160 PRINTTAB(4)"[RVSON][c G][31" "]"                   AN
•170 PRINTTAB(4)"[RVSON][31" "][RVSOFF][s
 EP]"                                                   BL
•180 PRINTTAB(4)"[c *][RVSON][26" "][c P]
 [c I][RVSOFF][c Y]"                                    EO
•190 PRINTTAB(5)"[c T][c Y][c U][RVSON][c
  I][RVSOFF][c U][RVSON][c I][RVSOFF][c U
 ][RVSON][c I][c O][c @][9" "][c @][c I][
 RVSOFF][c Y][c U][c Y]"                                LO
•200 PRINTTAB(16)"[c *][RVSON][6" "][RVSO
 FF][sEP]"                                              KC
•210 PRINTTAB(17)"[RVSON][6" "][RVSOFF][c
  J]"                                                   OJ
•220 PRINT" [RVSON][4"[c A]"][RVSOFF]"SPC
 (12)"[RVSON][6" "][RVSOFF][c K][4" "][RV
 SON][3"[c D]"][RVSOFF][6" "][RVSON][c A]
 [c A]"                                                 PL
•230 PRINT" [RVSON][4"[c A]"][RVSOFF] [RV
 SON][3"[c F]"][RVSOFF] [RVSON][3":"][RVS
 OFF][3" "][RVSON][c K][6" "][RVSOFF][c G
 ][4" "][RVSON][3"[c D]"][RVSOFF] [RVSON]
 [4"[c A]"][RVSOFF] [RVSON][c A][c A]"                  KN
•240 PRINT" [RVSON][4"[c A]"][RVSOFF] [RV
 SON][3"[c F]"][RVSOFF] [RVSON][3":"][RVS
 OFF][3" "][c N][RVSON][6" "][RVSOFF][c K
 ] [RVSON][c A][c A][RVSOFF] [RVSON][3"[c
  D]"][RVSOFF] [RVSON][4"[c A]"][RVSOFF]
 [RVSON][c A][c A]"                                     JF
•250 PRINT" [RVSON][4"[c A]"][RVSOFF] [RV
 SON][3"[c F]"][RVSOFF] [RVSON][3":"][RVS
 OFF][4" "][RVSON][6" "][RVSOFF][c G] [RV
 SON][c A][c A][RVSOFF] [RVSON][3"[c D]"]
 [RVSOFF] [RVSON][4"[c A]"][RVSOFF] [RVSO
 N][c A][c A]"                                          HJ
•260 PRINT"[c I][RVSON][4"[c A]"][RVSOFF]
 [c I][RVSON][3"[c F]"][RVSOFF][c I][RVSO
 N][3":"][RVSOFF][c O][c I][c @][RVSON][s
 EP][6" "][c *][RVSOFF][c @][RVSON][c A][
 c A][c U][3"[c D]"][RVSOFF][c O][RVSON][
 4"[c A]"][c T][c A][c A][RVSOFF][c O]";                CN
•270 PRINT"[RVSON] FUTURE'S SO BRIGHT I G
 OTTA WEAR SHADES "                                     OJ
•280 PRINTTAB(11)"PRESS SPACE TO EXIT":PO
 KE198,.                                                ND
•290 REM POINT SCREEN EDITOR TO HARMLESS                LC
•300 REM RAM LOCATION (192*256=49152)                   PK
•310 POKE648,192:PRINT                                  CF
•320 PRINTMID$("[RED][c 3][c 1][YELLOW][W
 HITE]",(RND(1)*5)+1,1):PRINTB$                         DI
•330 GETA$:IFA$<>" "THEN320                             IO
•340 POKE648,4:PRINT                                    KI
•350 REM MOVE SCREEN LINES                              IN
•360 PRINT"[CLEAR]"TAB(10)"MOVING SCREEN
 LINES"                                                 GL
•370 FORX=.TO20:POKE646,RND(1)*15+1:FORJ=
 .TO4:PRINTSPC(3)"[RVSON]"X;:NEXTJ:PRINT:
 NEXTX                                                  IK
•380 PRINTSPC(6)"[RVSOFF][WHITE]PRESS M T
 O MOVE LINE,X TO EXIT"                                 NN
•390 GETA$:IFA$<>"M"THEN430                             PB
•400 IFA$="M"THENT=(RND(1)*21)+1:F=(RND(1
 )*21)+1                                                JM
•410 POKE781,T:SYS59888:POKE172,PEEK(6065
 6+F):POKE780,PEEK(216+F)                               BO
•420 POKE783,.:SYS59848:PRINT"[HOME]"                   JK
•430 IFA$<>"X"THEN390                                   PD
•440 POKE53248+21,1:POKE2040,13:POKE53248
 ,170:POKE53249,180:POKE53248+16,.                      HN
•450 POKE53248+39,1                                     OM
•460 PRINT"[CLEAR][DOWN][DOWN]TYPE IN ANY
  CHARACTER :";                                         KO
•470 GETA$:IFA$=""ORA$<"A"ORA$>"Z"THEN470               NN
•480 PRINTA$                                            OC
•490 PRINT"I'M CREATING A STRING 63 CHARA
 CTERS LONGTO USE AS A SPRITE SHAPE."                   ON
•500 S$="":FORX=.TO63:S$=S$+A$:NEXT:PRINT
 "S$="CHR$(34)S$CHR$(34):PRINT                          LG
•510 PRINT"NOW WE PRINT THIS STRING TO TH
```

```
E SPRITE'S";                                  AL
•520 PRINT"BLOCK AT 828,SPRITE BLOCK 13":
PRINT                                         OK
•530 PRINT"POKE648,3:PRINTCHR$(19)CHR$(17
)SPC(20);S$:POKE648,4":PRINT                  MG
•540 PRINT"PRESS KEY FOR ANOTHER CHARACTE
R,CTRL-X  TO EXIT SHAPE DEMO"                 OP
•550 GOSUB580                                 FF
•560 POKE198,.:WAIT198,1:GETA$:IFA$=CHR$(
24)THENPOKE53248+21,.:GOTO600                 JP
•570 GOTO460                                  GG
•580 POKE648,3:PRINTCHR$(19)CHR$(17)SPC(2
0);S$:POKE648,4:RETURN                        EJ
•590 REM HORIZONTAL ROUGH SCROLLING           PD
•600 PRINT"[CLEAR]"TAB(5)"[BLUE]SIMPLE HO
RIZONTAL SCROLLING"                           EH
•610 PRINTTAB(6)"[DOWN][DOWN]CURSOR KEYS
LEFT <-> RIGHT"                               EF
•620 PRINTTAB(7)"X TO EXIT SCROLLING DEMO
"                                             IP
•630 POKE214,21:PRINT:PRINTTAB(15)"STAND
BY!":FORX=.TO39:PRINT"[c U]";:NEXT:PRINT
"[c 4]";                                      BI
•640 REM SCROLL DATA IN FOUR STRINGS          NM
•650 DIM L$(39),M$(39,3),S$(3)                DB
•660 S$(.)="[12" "][c A][c S][10" "][c A]
[c S][11" "][c A][c S] "                      IP
•670 S$(1)="  [c A][c R][c S][3" "][s U][
s I]  [c Q][c W][7" "][c A][c S] [c Q][c
 W][5" "][c A][c S][4" "][c Q][c W] "         FO
•680 S$(2)="  [c Q][s +][c W][3" "][c Q][
c W]  [c Q][c W][3" "][s U][s I]  [c Q][
c W] [c Q][c W][c A][c S]  [c A][c X][s
B][c A][c S]  [c Q][c W] "                    CJ
•690 S$(3)="[c A][c S][c Q][s +][s +][c R
][c R][c S][c Q][c W][c A][c S][c Q][s +
][c S][c A][c S][c Q][c W][c A][c S][c Q
][c W][c A][c X][c Z][c X][c Z][s C][s C
][c X] [c Z][c E][c E][c R][s C][c E][c
E][s C]"                                      PL
•700 FORJ=.TO3:FORX=.TO39:M$(X,J)=RIGHT$(
S$(J),39-X)+LEFT$(S$(J),X):NEXTX,J            FA
•710 FORX=.TO39:FORJ=.TO3:L$(X)=L$(X)+M$(
X,J)+" ":NEXTJ,X                              GE
•720 X=.:POKE198,.                            LD
•730 POKE214,18:PRINT                         FM
•740 PRINTL$(X);:FORJ=.TO50:NEXT              EN
•750 GETA$:IFA$=""THEN750                     CH
•760 IFA$="[LEFT]"THENX=X+1+(X=39)*40         LN
•770 IFA$="[RIGHT]"THENX=X-1+(X=.)*-40        CM
•780 IFA$="X"THEN810                          IO
•790 GOTO730                                  DL
•800 REM SCROLLING DIAGONAL LINES             BE
•810 POKE53281,5:POKE53280,13:PRINT"[CLEA
R][WHITE]EVERYBODY PLAY FOOTBALL!"            CE
•820 PRINT"PRESS SPACE TO RUN A TOUCHDOWN
!":POKE198,.:WAIT198,1                        JL
•830 FORX=.TO500:PRINT"[s M][DOWN]";:NEXT     DD
•840 REM CLEAR SCREEN LINES                   IM
•850 POKE53281,.:POKE53280,.                  EK
•860 PRINT"[CLEAR]"TAB(10)"CLEARING SCREE
N LINES"                                      PD
•870 FORX=.TO20:POKE646,RND(1)*15+1:PRINT
B$;:NEXT                                      OF
•880 PRINTSPC(5)"[RVSOFF][WHITE]PRESS C T
O CLEAR LINE,X TO EXIT"                       DB
•890 GETA$:IFA$="C"THENPOKE781,(RND(1)*21
)+1:POKE783,.:SYS59903                        BB
•900 IFA$<>"X"THEN890                         NI
•910 REM CURTAIN EFFECT USING DELETE CHR$     PD
•920 POKE53281,.:POKE53280,6:PRINT"[BLUE]
"                                             OE
•930 PRINT"[CLEAR]":FORI=.TO22:FORX=.TO37
:PRINT"[RVSON][s B]";:NEXT:PRINT:NEXT         LP
•940 PRINT"[HOME]PRESS SHIFT TO OPEN CURT
AIN"                                          EC
•950 POKE214,10:PRINT:PRINTTAB(10)"[RVSON
]CURTAIN OPENING":WAIT653,1                   IJ
•960 FORI=.TO39:PRINT"[HOME]";:FORJ=.TO23
:PRINT"[RIGHT]"CHR$(20):NEXTJ,I               CA
•970 REM RANDOM MAPPING                       FB
•980 POKE53281,6:POKE53280,.:PRINT"[CLEAR
]"CHR$(14)TAB(14)"[c 8][DOWN][DOWN][s M]
AP [s C]REATOR"                               OG
•990 PRINTTAB(7)"[DOWN][c 7][s P]RESS [s
A] [s K]EY [s T]O [s C]REATE [s M]AP":PO
KE198,.:WAIT198,1:PRINT"[CLEAR]"              NH
•1000 REM EXPERIMENT WITH DIFFERENT SEED      IK
•1010 REM VALUES FOR THE RANDOM FUNCTION      NM
•1020 REM TO CHANGE MAP LAYOUT                GD
•1030 X=RND(-2.1)                             FA
•1040 PRINT"[c 2]";:A$="[c +]":POKE214,10
:PRINT:PRINTTAB(20);:FORX=.TO999:GOSUB11
00:NEXT                                       NH
•1050 PRINT"[GREEN]";:A$="[PI]":FORX=.TO1
00:GOSUB1100:NEXT                             GN
•1060 PRINT"[c 6]";:A$="[sEP]":FORX=.TO30
0:GOSUB1100:NEXT                              FG
•1070 PRINT"[BLACK]";:A$="[c *]":FORX=.TO
300:GOSUB1100:NEXT                            LN
•1080 POKE214,22:PRINT:PRINTTAB(12)"[WHIT
E][s L]AND OF [s A]DVENTURE";:GOTO1130        LH
•1090 REM DRAW TERRAIN SUBROUTINE             II
•1100 PRINTA$;MID$("[UP][DOWN][LEFT][RIGH
T]",RND(.5)*4+1,1);"[LEFT]";                  BM
•1110 IFPEEK(214)>22THENPRINT"[UP]";          PJ
•1120 RETURN                                  PC
•1130 POKE198,.:WAIT198,1:PRINTCHR$(9)        NB
```

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128 SMART MERGE

FROM PAGE 50

```
•100 REM ** 128 SMART MERGE FROM AHOY! ** KM
•110 REM *(F)ABRICATED BY SHAWN K. SMITH* LF
•120 :             BANK 15             : EA
•130 S$="$1400":TC=24438:R$=CHR$(18)      OK
•140 PRINT"[CLEAR][DOWN]","[3">"] [RVSON]
 128 SMART MERGE[RVSOFF] [3"<"]"          NH
•150 INPUT"[3"[DOWN]"]STORE AT";S$:S=VAL(
 S$):IFSTHEN160:ELSES=VAL(STR$(DEC(MID$(S
 $,2))))                                  IG
•160 H=S/256:IFH<>INT(H)ORH=0THENSTOP     PL
•170 FORD=STOS+255:READY$:C=DEC(Y$):T=T+C PD
•180 POKED,C:NEXT:PRINT:IFT=TCTHEN200     NG
•190 PRINTR$"?? RECHECK DATA!";T;TC:STOP  JN
•200 FORM=STOD:IFPEEK(M+2)=20THENIF(PEEK(
 M)=141ORPEEK(M)=173)THENPOKEM+2,H        FN
•210 NEXT:POKES+135,H:POKES+152,H:PRINT   FC
•220 PRINT"TO MERGE: [RVSON]SYS";S:END    NP
•230 DATA A5,2D,85,FB,48,A5,2E,85,FC,48   NN
•240 DATA A0,00,68,85,2E,68,85,2D,B1,2D   GG
•250 DATA 48,C8,B1,2D,F0,10,48,C8,B1,2D   NA
•260 DATA 8D,70,11,C8,B1,2D,8D,71,11,18   DO
•270 DATA 90,E0,68,AD,10,12,85,FD,AD,11   OH
•280 DATA 12,85,FE,AD,00,03,8D,8E,14,AD   PI
•290 DATA 01,03,8D,8F,14,20,81,92,0D,46   CJ
•300 DATA 49,4C,45,4E,41,4D,45,20,3D,3E   KP
•310 DATA 00,20,93,4F,86,3D,84,3E,20,80   ND
•320 DATA 03,AA,F0,4D,8C,12,02,A0,0F,B1   AD
•330 DATA 3D,99,02,02,88,10,F8,A9,F0,8D   CI
•340 DATA 00,02,A9,22,8D,01,02,AD,02,03   IF
•350 DATA 8D,90,14,AD,03,03,8D,91,14,A9   JI
•360 DATA 92,8D,02,03,A9,14,8D,03,03,4C   FK
•370 DATA DC,4D,00,00,00,00,A9,CC,8D,00   KF
•380 DATA 03,A9,14,8D,01,03,AD,90,14,8D   OH
•390 DATA 02,03,AD,91,14,8D,03,03,20,B7   MO
•400 DATA FF,C9,40,D0,1E,A9,00,85,5C,85   FG
•410 DATA 5D,8D,73,11,A9,0A,8D,72,11,18   GE
•420 DATA 6D,70,11,8D,70,11,90,03,EE,71   EA
•430 DATA 11,4C,68,5B,2C,A2,80,AD,8E,14   CJ
•440 DATA 8D,00,03,AD,8F,14,8D,01,03,8A   KI
•450 DATA 30,13,A5,FD,8D,10,12,A5,FE,8D   BC
•460 DATA 11,12,A0,02,A9,00,91,2D,88,10   KP
•470 DATA FB,A5,FB,85,2D,A5,FC,85,2E,A9   LA
•480 DATA 00,85,7A,6C,00,03               LN
```

SCREEN WIZARDRY

Continued from page 31

CLEAR OR PARTIALLY CLEAR SCREEN LINE

To clear any screen line where L=line number,

```
POKE 781,L:POKE783,0:SYS59903
```

To clear part of a line counting from the left, where L= line number and LN=number of spaces to be cleared,

```
POKE781,L:POKE782,LN:POKE783,0:SYS59905
```

The demo lets you erase screen lines randomly until you press the "X" key.

CURTAIN EFFECT

This short little ditty will pull everything on the screen off to the left side using the DELETE character. Good for title screens.

CREATE RANDOM TERRAIN

Great for dungeon adventures, war games, and never-never lands. Let this short subroutine run for a while with the characters of your choice in the string A$, and a map of a world that never was will be generated on the screen with little or no effort. You can create different terrain features by changing the character and starting location for each feature. The string A$ can be printed with different colors to represent mountains (gray), deserts (brown), or forests (green). The seed value of the first RND(X) statement determines what the map will look like.

That's only a slice of the possibilities, but you should be pretty thrilled by now at the potential in editor tricks. Feel free to steal any of the subroutines in the demo for your own applications. We would love to see good quality games in *Ahoy!* using the clever routines described in this short article, and you're encouraged to try your hand at incorporating these ideas into your own programs. □

SEE PROGRAM LISTING ON PAGE 96



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